THURSDAY, AUGUST 24, 1876

EASTERN PERSIA

Eastern Persia. An Account of the Journeys of the Persian Boundary Commission. Published by the Authority of the Government of India. Two vols. (London: Macmillan and Co., 1876.)

IN the year 1837 a Treaty was concluded at Paris between the English and Persian Governments, under the provision of one of the articles of which it was arranged that the Shah should "refer for adjustment to the friendly offices of England" any differences that might occur "between Persia and Herat or Afghanistan."

During his Indian viceroyalty one of the questions which attracted the serious attention of Lord Mayo was that of the relations of Sistan, a province on the eastern frontier of Persia, which, though at the time properly belonging to Afghanistan, was being gradually encroached upon by its western neighbours. Both Governments appealed to England, and to settle the question at issue—the boundary-line—an arbitrator was appointed in the person of Sir Frederic J. (then Colonel) Goldsmid, who was at the time Director-in-Chief of the Government section of the Indo-European Telegraph. His instructions were, after he had decided the Sistan boundary, to proceed to Baluchistan and also settle the disputed frontier between that country and Persia, a point of special interest to ourselves, as it affects the facility of retaining in an efficient condition the telegraphic communication through Persian territory. Though this was the plan originally proposed, unexpected difficulties were the cause of its being considerably modified; the result was, however, the same in the long run.

Sir F. Goldsmid left this country on his special mission at the end of August, 1870, and had finally returned from it in the middle of September, 1872. He was accompanied by Major Euan Smith, his secretary, who, in the work under consideration, gives a most interesting and detailed account of both the Perso-Baluch Frontier Mission which was undertaken in 1870–71, and of the Perso-Afghan Mission of 1871–72.

The Introduction to the whole work is by Sir F. Goldsmid. In it the author briefly, but clearly, explains our relations with Baluchistan and Afghanistan, the internal government (or lack of government) in those countries, and the most important events of recent date in their history which bear upon, together with the steps which have been taken by this country to assist in, their consolidation.

Majors Oliver St. John and Lovett, of the Royal Engineers, and Major Euan Smith, of the Madras Army, are the authors of the first volume of the work. Major St. John, who had previously been employed in the Telegraph Department at Tehran, has a valuable chapter upon the Physical Geography of Persia, followed by an account of his journey with Mr. Blanford through Baluchistan and Southern Persia, undertaken with the object of further investigating the topography of the district through which Sir F. Goldsmid had been compelled from various reasons to fix the Perso-Baluch boundary rather precipitately. Major St. John gives three maps of Persia in association with his valuable account of the nature of the country—the first hydrographical, the second orographical, and the last showing the routes of the different members of the mission.

Major Beresford Lovett, who accompanied the Arbitrator during both his missions, and performed the preliminary survey of the Makran region, gives a narrative of his journey in Baluchistan, laying special stress on those places not referred to by Major St. John.

Major C. B. Euan Smith, as above mentioned, describes the journeys performed by Sir F. Goldsmid and himself, undertaken with the object of deciding the Perso-Baluch and Perso-Afghan boundaries. His narrative possesses all the interest which is inherent in the accounts of the habits and customs of people not well known by most of us, as told by an able and observant traveller.

The second volume is devoted to Mr. Blanford's account of the zoology and geology of Persia. Mr. Blanford's great experience as a field naturalist both in India and Abyssinia enabled him to undertake the study of the fauna of Persia with a feeling of confidence that he would do justice to the subject which few others could have possessed, and we are sure that all who carefully peruse the work before us will fully appreciate the advantages which have accrued to biological science from his efforts. Besides his own collection, Mr. Blanford has had the opportunity of studying that made by Major St. John between the years 1869-71, whilst he was employed in superintending the construction of the telegraph line through Persia.

To the information given us by Gmelin, Pallas, De Filippi, and others on the fauna of Persia, Mr. Blanford greatly adds. His brief *résumé* of the physical geography of the country, fully described by Major St. John in the first volume of the book, gives an excellent idea of the region. "The country consists of a number of desert plains, at various elevations of from about 1,000 to 5,000 feet above the sea, separated from each other, from the lower country to the east, north, and west, and from the coast to the south, by ranges of mountains varying much in height and breadth, but often of considerable elevation. The Persian plateaux, or highlands, consist of plains and ranges of hills, for the most part destitute of vegetation, agriculture being only possible where water can be obtained from springs or the small streams which descend from the higher ranges to lose themselves in the various deserts of the interior. Along the southern coast of the Caspian Sea is a damp region covered with dense forest, and the western slopes of the Zagros Mountains are also wooded, though less thickly, than the northern slopes of the Elburz. The Zagros belt of woodland extends south to the neighbourhood of Shiraz, where, from the prevalence of a species of oak, the tract is often spoken of as the Oak Forest. This tract is crossed on the road from Shiraz to Bushire, but it does not extend much farther to the south-east. There are, however, in the broken country, extending along the shores of the Persian Gulf and Indian Ocean, and forming part of Fars, Laristan, and Baluchistan, a few plains and valleys which support a rather thin forest, the trees being different from those of the Zagros and Shiraz forests, and consisting chiefly of tropical forms, among which tamarisk and mimosa are conspicuous. These comparatively fertile tracts are however seldom met with, the greater part of the country being as barren as the Persian highlands."

On account of the differences in the physical condition of the country above indicated, its fauna correspondingly varies; and, according to Mr. Blanford, five zoological sub-regions may be defined with tolerable accuracy. Each of these deserves brief reference upon the present occasion. The first is that of the Persian plateau or highland, which forms by far the greatest and most characteristic part of the country. Although this district, and all the others except the last, are Palæarctic in their nature, nevertheless several types characteristic of the desert tracts of North Africa and Central Asia are included, such as the genera *Gazella*, *Gerbillus*, *Dipus*, *Gyps*, and *Buteo*.

The second sub-region is that of the Caspian provinces Ghilan and Mazandaran, which form the forest-covered, humid southern shore of the Caspian Sea. The fauna is almost identical with that of South-east Europe. The tiger is found there, however, and a Deer (*Cervus caspius*) closely allied to the Axis Deer of India, as well as a Pit-viper (*Halyx*).

The third sub-region is that of the wooded slopes of the Zagros, running from Shiraz, as a strip, in a north-westerly direction. It differs, as far as is known of it, but little from the last, with which it may be confluent. The lion inhabits it, as well as a new species of Woodpecker (*Picus sancti-johannis*). The fourth sub-region is that of Persian Mesopotamia, which is the eastern portion of the Tigris plain. It closely resembles Syria in fauna. The last is that of Baluchistan and the shores of the Persian Gulf, which differs greatly from the rest of Persia, Indian or Indo-African forms prevailing.

Mr. Blanford enumerates eighty-nine species of mammals, three hundred and eighty-three of birds, ninety-two of reptiles, and nine of amphibia, as found in Persia; and he mentions as a general characteristic of the fauna, that the specimens are paler in colour than their European allies. This paleness frequently makes it difficult to decide whether the species are new or only varieties of those already known. In some cases, however, as, for instance, that of the Persian Badger, the author tells us that he would not have proposed a new name for it had not the skull, when compared with a series of skulls of *M. taxus*, presented decided differences.

The number of fresh species determined by Mr. Blanford and others from the collection made by Major St. John round Shiraz between 1869 and 1871, and by both these naturalists in their journey through Baluchistan and Southern Persia, is too large to be enumerated here. Of new genera Mr. Dobson determined the Phyllorrhine Bat (*Triaenops persicus*), with its very complicated nose-leaf and peculiar third alar digit, in 1872; and Mr. Blanford has, from an exhaustive study of the reptiles, made the genera *Bunopus*, *Ceramodactylus*, *Agamura*, and *Zygnopsis*. Curiously, no crocodiles are known to occur in the country, though they are common in the neighbourhood of Sind, and are to be found in Palestine; their absence is associated with the inconstancy of the supply of water in the small rivers. The Agamoids and Lacertians are much more abundant than the Geckos and Scincids.

Of the placental mammals the Quadrumana, Proboscidea, Hyracoidea, and Edentata, are the orders which are not represented in Persia. Bats are not numerous, as far as species are concerned. Of Insectivores another species of hedgehog is described and figured. *Vulpes persicus* is the name given to a fresh Fox, and *Meles canescens* to the Pale Badger above mentioned. Among the Rodentia several new species have been discovered, including a squirrel, a dormouse, a mouse, two jumping-rabbits, a jerboa, and a hare. No specimen of the male of the new *Gazella fuscifrons* was obtained, although Major St. John, in his narrative, tells us that he lost the only one he saw from his cartridge missing fire.

Of new birds we find a Woodpecker (*Picus sancti-johannis*), a Robin (*Erythacus hyrcanus*), a Warbler (*Sylvia rubescens*), a Sun-bird (*Nectarinia brevirostris*), a Nuthatch (*Sitta rupicola*), a Tit (*Parus phaeonotus*), as well as a second (*P. persicus*), and a Jay (*Garrulus hyrcanus*). Besides the new genera of reptiles above mentioned, there are many fresh species, the descriptions of all of which, as of the mammals and birds, are accompanied by excellent figures from the pencil of Mr. Keulemanns or the late Mr. G. H. Ford, whose recent death will be felt as a great loss to naturalists generally and students of the Reptilia especially, because of the extreme care which he was always accustomed to take in the accurate delineation of the most minute detail.

What will strike the readers of the work before us most forcibly is the great pains which Mr. Blanford has taken in the accurate determination of the species he describes, and the trouble he has put himself to—by a reference to the original types—in whatever part of Europe they may be—to insure their correct identification. In many cases he has been able to give his measurements from unskinned specimens, and in several instances among the birds he has recorded the essential lengths of a large number of specimens. As an instance of this may be taken the case of *Hypolais pallida* and its allies, in which a lengthy series of measurements is given to show the complete gradation between that species, *H. rama* and *H. caligata*, forms whose specific identity is based upon slight differences in size only.

In the geological section of the volume no complete account of the geology of Persia is attempted, but Mr. Blanford adds his own experience to that of Messrs. Loftus, Bell, Grewingk, Carter, and others.

In concluding this brief notice of the valuable work before us, we feel that it is only by a detailed perusal of its contents that its value in a geographical, zoological, geological, and political point of view can be fully appreciated.

SUMNER'S "METHOD AT SEA"

Tables for Facilitating Sumner's Method at Sea. By Sir William Thomson, D.C.L., LL.D., F.R.S., Professor of Natural Philosophy in the University of Glasgow, and Fellow of St. Peter's College, Cambridge. (London: Taylor and Francis, 1876.)

THE reforms which Sir William Thomson has effected or suggested in the art of navigation are neither few nor unimportant. His invention of deep-sea sounding by pianoforte wire, and his improvements in the construction of the mariner's compass, are specimens of what he has done in the instrumental part of the subject. In the book now before us he again comes forward as a

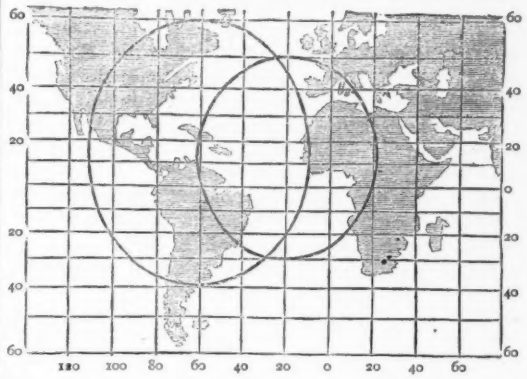
nautical reformer, this time in another section of the field, that, namely, which treats of the calculations following on the astronomical observations of the sun or stars, which form part of the daily routine work of every navigator. Innocent as the title of the book appears, the general adoption of the method which it advocates would amount to little short of a revolution in nautical practice—a revolution which is urgently needed, and which would unquestionably be of immense advantage to sailors in more ways than one.

When an observer takes the altitude of the sun or of a star at a known instant of Greenwich mean time, he learns two things. His knowledge of the time, when brought to bear upon the information which he finds in his nautical almanac, tells him that the sun or star was vertically overhead at a certain known point on the earth's surface at the time of the sight. His knowledge of the altitude tells him that the ship was at the same time somewhere on an imaginary circle drawn on the earth's surface, the centre of which is the point where the sun or star was vertically overhead, and which lies at an angular distance from this centre (measured on the terrestrial globe) equal to the complement of the altitude. On what part of this imaginary line he is, his sight does not tell him, but he can easily make a guess to within sixty miles or so. If, then, he can draw a portion of this circle, short enough to be taken without sensible error as a straight line, in that part of his working chart in which he knows his ship to be, he will have obtained from his sight all the information which that one sight can give him, and no more. This is so very obvious, that it seems strange that no one should have pointed it out before 1843. Nevertheless, it appears to be the case that Capt. Thomas H. Sumner, of Boston, Mass., was the first to do so, and to publish a practical method of drawing the line we have spoken of. The circle on any part of which the ship may be is now commonly called a Sumner circle of equal altitude, for from every point in it the altitude of the body observed is the same at the time of the sight. The short straight portion of it which in practice is drawn on the working chart, is called a Sumner line.

To illustrate the drawing of Sumner circles we cannot, perhaps, do better than quote the example given in the preface to Sir William Thomson's book :—

"Suppose that the altitude of the sun's centre was observed to be 50° at 1h. 17m. 48s. P.M., Greenwich mean time, on the 27th August, 1874. From the *Nautical Almanac* we learn that the sun 'southed' at Greenwich at 11h. 57m. 48s. A.M. on that day, therefore at the instant of the observation he was due south of a place one hour and twenty minutes in time, or twenty degrees in angle west of Greenwich. His declination at the time of the sight was 10° N. Hence he was overhead in lat. 10° N., long. 20° W. If one point of a pair of compasses be put on this point on a globe representing the earth, and a circle be drawn by the other point running at 40° (that being the zenith distance or complement of the altitude) from this point, this circle will be such that at any point on its circumference the altitude of the sun was 50° at the instant of the observation. The chart given below shows this circle drawn on Mercator's projection, which, of course, draws out the north and south parts and prevents it from appearing like a true circle. The circle corresponding to the example just given is the eastmost one on the chart.

"Suppose now that 2h. 40m. later the altitude of the sun is again taken and found to be 40°. At the moment of this second observation the ship was somewhere on the other circle, the westmost of the two given on the chart. What we learn from the two observations, then, is



that at the time of the first observation the ship was somewhere on the circle to the right, and at the time of the second observation she was somewhere on the circle to the left. If, therefore, she did not change her place between the two observations, she must have been at one or other of the two points in which the circles intersect."

It is, of course, as impracticable as it is unnecessary to draw the whole of the Sumner circle corresponding to each observation. Sumner's method may be defined as any practical method by which the short straight portion called a Sumner line can be drawn. This may be done in either of two ways. Here, again, we may quote Sir W. Thomson :—

"Every part of the Sumner circle is perpendicular to the true bearing of the body observed, and therefore the azimuth of the body observed is equal to the angle which the Sumner line makes with the parallels of latitude. Hence, if we know the latitude and longitude of one point in the Sumner line, and also the true azimuth of the body observed, we are able to draw the line on the chart. This brings us to the consideration of practical methods of drawing the Sumner line for an observation. Let the latitude be estimated to (say) the nearest degree, and let the longitude be calculated corresponding to this latitude. This gives us the latitude and longitude of one point on the Sumner line. Next calculate the true azimuth of the body observed at the time of the sight. Then through the point draw a line making an angle with the parallels of latitude equal to the true azimuth, and so as to be perpendicular to the true bearing of the body. The line so drawn is the Sumner line, and all that any one sight tells us is that the ship is somewhere upon it.

"It is, however, more usual to calculate the longitude of two points on the Sumner line corresponding to two estimated latitudes, differing by half a degree or more, and then to draw on the chart the line passing through the two points so determined. This last is the plan given by Captain Sumner."

Each of these plans is a little tedious, for each involves two distinct calculations. But since the Sumner line is really the only true statement of what any sight tells, we might expect that, spite of its tediousness, Sumner's method would be found in general use. Unfortunately it is not so. The usual practice among sailors is not to work out every sight independently, but to complicate the conditions of the problem by the introduction of some new element in order to shorten the work of calculation. Sum-

ner's method gives, as we have seen, a line on which the ship is, and in doing so it gives us all the information which any one sight can yield. But if we possess some other information, such as a knowledge of the true latitude, the position becomes completely determinate; each condition gives a locus, and the intersection of the two loci gives a point. By introducing this foreign element into the calculation of the original sight, we may obtain at once the definite information that the ship is in a certain latitude and longitude, and we may do so by a single calculation. This is the practice of ninety-nine navigators out of a hundred, but it is a practice much to be deprecated. It makes the sailor imagine that a knowledge of the latitude, got either by dead reckoning or by taking a meridian altitude, is necessary in order that he may get any information at all out of a single observation of altitude and time. If he trusts to obtaining this knowledge by dead reckoning he is likely enough to estimate the latitude wrongly, and by so doing to vitiate the whole calculation. If he trusts to observing the meridian altitude, he is often disappointed by the sun's being clouded over at noon. Many a captain has lost his ship through not knowing how to avail himself (by Sumner's method) of the information which he might have derived from a short glimpse of the sun on a cloudy day. Another danger in the ordinary practice is that it tempts the navigator not to work out each sight as soon as it has been taken, for he must often wait until he is able to obtain the other information, without which he is helpless. But when Sumner's method is used, every sight tells its own tale, and there is no reason whatever why it should not tell it at once.

The limits of a review do not admit of our describing the manner in which Sir William Thomson has contrived to facilitate Sumner's method. A full explanation of how it has been done will be found in the preface to his book. At first sight it appeared that, in order that tables might be of any use, they would require to contain the solutions of 157,464,000,000 spherical triangles, to calculate which, at the rate of 1,000 per day, would take 400,000 years. This did not seem promising, but Sir William Thomson was not dismayed. He soon saw that by dividing the problem into the solution of two right-angled spherical triangles he could give all the required information in a table containing the solutions of only 8,100 triangles. These 8,100 calculations have been made under the superintendence of Mr. E. Roberts, of the *Nautical Almanac* Office, and the results are tabulated in the volume before us. Full instructions for their use are appended, along with some auxiliary tables which add greatly to the completeness of the work. Not to go into details, we may say that by an admirable application of the *second* of the two plans given above for drawing the Sumner line, the author has so shortened the time required to reduce an observation, as to convert what was formerly an objection to Sumner's method into a positive recommendation, and so has deprived sailors of their only possible excuse for not adopting it universally.

Such a general adoption, besides its direct benefits in increasing the safety of ships and men at sea, could not fail to have a great indirect effect for good in assisting the sailor to a clear perception of the fundamental principles underlying the processes which he daily employs, too often, we fear, in blind routine. A seaman using Sumner's method can hardly help understanding what he is about, but he may work for a lifetime with the hackneyed formulæ in common use, and have no notion from first to last of why he should add a quantity rather than subtract it, or indeed of why he should deal with it at all. We have heard of a captain who used a *plus* instead of a *minus* sign for two or three weeks, and first suspected that something must be wrong when he found himself on a coral reef hundreds of miles off his supposed course. When a landsman with a smattering of mathematics goes to sea and is admitted to the privacy of the chart-room, his wonder is, not so much that some ships are lost, as that any ships escape.

It is not the masters or the mates that are chiefly to blame for this state of things. Before they enter the service their utmost immediate ambition is to get the needed certificate of competency from the Board of Trade, and they naturally study only to pass the required examination. Then afterwards their professional life is not exactly that calm repose which conduces to progress in a scientific knowledge of their art. There are no doubt exceptional men whose love of their profession is so strong as to override the barriers of circumstance. Such men deserve all praise, but we can hardly blame the rest. For a remedy we must look not to the individual officer but to the authorities who have the making of him. It is strange that the Board of Trade should not have seen it to be a duty to let no British seaman obtain its certificate without showing himself to be thoroughly acquainted with Sumner's method. Until the Board does this it will be mainly, we might say almost wholly, responsible for the prevailing neglect of this method.

The position of the nautical reformer seems to us to be anything but enviable. His virtue is perhaps its own reward, certainly he seldom meets with any other. The Board of Trade and the Admiralty will have none of him, and he cannot make much way against the conservatism bred of ignorance that he finds elsewhere. It is still fresh in the memory of every one how Mr. Plimsoll at last compelled a reluctant government to take legislative action on behalf of seamen. Unfortunately, Sir William Thomson must confine himself to milder methods: he has no opportunity of shaking his fist in the face of a prime minister.

OUR BOOK SHELF

Botanical Tables for the Use of Students. Compiled by Edward B. Aveling, B.Sc. Second Edition. (London: Hamilton, Adams, and Co.).

ANY attempt to compress the facts of nature within the arbitrary limits of a defined tabular statement must necessarily be misleading from a scientific, that is, from a philogenetic, point of view. Classificatory tables have nevertheless their use to the student, in aiding his memory by bringing a large number of facts within a small compass. Dr. Aveling is careful to disavow any independent value for his tables, and frankly states that they will not only be useless, but positively injurious, if allowed in any way to be a substitute for practical field-work. With these limitations the tables may be recommended as probably as good, or nearly so, as any that could be drawn up. They have been compiled carefully, and on the whole successfully. Defects can no doubt be pointed out. Thus the description of certain inflorescences as "centripetal arranged centrifugally" requires a foot-note to explain its

meaning; the class *Gymnospermæ* is given on one page as of superior value to *Incompletæ*, on another as included within it; and it is difficult to understand how the terms "loculicidal" and "septicidal" can be applied with propriety to a mono-carpellary capsule like that of the primrose. The statement that "the tables on classification have been compiled from Dr. Hooker's 'Student's Flora of the British Islands'" is rather misleading, when we find, on p. 14, the Gamopetalous orders with inferior ovary included in "Calycifloræ." But defects of this sort are incidental to any attempt of the kind. Dr. Aveling may be congratulated on the success of his effort, if it be not of a very high order.

Vergleichende Untersuchungen über den Bau der Vegetationsorgane der Monocotyledonen. Von Dr. P. Falkenberg. Mit drei Tafeln. (Stuttgart: F. Enke, 1876.)

OUR knowledge of the anatomical structure of the stem of Monocotyledons has hitherto been pretty much confined to that of palms, and has been founded to a great extent on the researches of Mohl and Mirbel. It has hence been assumed, perhaps somewhat rashly, that the type of structure is far more uniform in the stem of Monocotyledons than of Dicotyledons. For the purpose of investigating this point Dr. Falkenberg has submitted to very careful examination the stem of one or more species belonging to as many as seventeen orders or sub-orders of Monocotyledons, and shows that our previous conceptions must be modified in several respects. The stem of Monocotyledons, he states, is divided into an inner central cylinder and an outer cortical layer by a separating sheath which is developed in some cases from the internal, in other cases from the external tissue. As regards the course of the fibrovascular bundles in the central cylinder, and the degree to which they are differentiated from the fundamental tissue, he finds three different types of structure. Perhaps the most important correction of ideas previously accepted is his complete refutation of the statement found in so many text-books, that Monocotyledons have none but adventitious roots. Dr. Falkenberg asserts that the existence of a normal tap-root is general in Monocotyledons, with the exception of those that are altogether destitute of a root. The adventitious roots which subsequently, in many cases, supplant the original tap-root, do not differ from it in an anatomical point of view. A. W. B.

Jenkinson's Practical Guide to the Isle of Wight. By Henry Irwin Jenkinson, F.R.G.S., &c. Also Smaller Practical Guide. (London: Stanford, 1876.)

MR. JENKINSON, by his practical guides to the Lake District, Carlisle, and the Roman Wall, has already proved himself possessed of a rare faculty for the work of guide-book making. The handy volumes before us are quite equal to those previously published. The "Guide to the Isle of Wight" is evidently the result of conscientious work and minute painstaking; the author has gone over all the ground described, and made himself well acquainted with all the historical and antiquarian knowledge which adds interest to the various places referred to. The introduction to the larger "Guide," covering upwards of eighty pages, contains a *résumé* of the scientific knowledge which bears on the island—its geology, its flora, and its fauna. This part seems to us carefully and accurately compiled, and by the scientific visitor will be considered a valuable addition to the volume. Mr. Jenkinson divides the text of his "Guide" into six sections, grouped round the chief towns of the island, each section being accompanied by a full and clear and carefully executed map. Altogether Mr. Jenkinson's "Guide" is a thoroughly good, and we believe trustworthy, one; and while it deserves the title "practical," and will be of the greatest use to the visitor, the general reader might read it through with interest and profit.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

A Science Museum

THE fact that the Science and Art Department have had before them for at least ten years the proposal to establish a science museum, is shown conclusively enough in NATURE for last week. May I be allowed to draw attention to a still earlier suggestion of the same character? As far back as 1859, two years after the establishment of the Patent Office Museum, the Commissioners of Patents laid a Report before Parliament, in which the following passage occurs:—

"It is intended to make the Patent Office Museum an historical and educational institution for the benefit and instruction of the skilled workmen employed in the various factories of the kingdom, a class which largely contributes to the surplus fund of the Patent Office in fees paid upon patents granted for their valuable inventions. Exact models of machinery in subjects and series of subjects, showing the progressive steps of improvement in the machines for each branch of manufacture, are to be exhibited; for example, it is intended to show in series of exact models each important invention and improvement in steam propellers [steamboat propulsion] from the first engine that drove a boat of two tons burden to the gigantic machinery of the present day, propelling the first-rate ship of war or of commerce. The original small experimental engine that drove the boat of two tons burden, above referred to, is now in the museum, and is numbered one in the series of models of propellers."

Unhappily this brilliant project rested unfulfilled. "No. 1" of the series of models of steamboat propellers had but few followers, while other branches of mechanical science did not get so far as to have even a "No. 1." The conception was excellent, the execution lamentably deficient. Thus the collection which was to have expanded into a museum of mechanical and industrial science degenerated into an old lumber-room, and, instead of expanding over the ground originally allotted to it, contracted into its present dimensions.

Into the causes of this failure there is no need to enter. The thing has failed, and there is an end of it. Luckily there is a chance of something better now, and it is to be hoped that we shall soon have the collection belonging to the Patent Office divided into two parts—one part to be sent to the Science Museum, and the other to the nearest dust-heap. So long as it belongs to the Patent Office, the aggregation of rubbish will be sure to continue. The Commissioners have never exercised a power of selection, and any foolish invention, so that it is only the subject of a patent, has the right of *entrée*. Naturally it is not the important inventions which make their appearance at South Kensington. As part of a Patent Office, a museum is practically worthless. It is hardly possible to imagine an invention which—at least to an expert—cannot be as clearly explained by descriptions and drawings as by a model. For purposes of experiment and instruction models are obviously invaluable. By no other means, for instance, can *motion* be rendered intelligible to a class of students or a popular audience. When the object, however, is simply to define what an inventor has discovered or constructed, so that it can be understood by an expert, a drawing and a description are nearly always much better—always as good—as any model. The only reason why the Patent Office should have charge of such a museum is that the officials of the office are in constant communication with the particular class likely to contribute to the museum. Patent cases are fruitful in models, constructed, not for the engineers, but to enable the engineers to explain to those who have no special mechanical knowledge the action of the different apparatus before them. Many such models are of no public interest, but many are well worth preservation, and it was thought that from these and like sources the Patent Office Museum would soon grow rich. The event has hardly justified the hope, but that is no reason why, under better management, the promises held out fifteen years ago should not now be realised. With all its deficiencies, the Patent Office Museum has done one good service. It has preserved some quite invaluable examples of early mechanical science which would otherwise have been scattered to the four winds—most of them to the west wind and the States. These are ready to form the best possible foundation for the mechanical section of the Science Museum, a section

which, in a great manufacturing country like this, ought certainly not to be the least important of all. H. T. WOOD.

Society of Arts, Aug. 22

The Diurnal Inequalities of the Barometer

LIKE the author of the interesting paper on the daily inequalities of the barometer in NATURE, vol. xiv. p. 314, I am one of those who are waiting for the appearance of the second part of Mr. Buchan's essay on this subject. Perhaps the coming meeting of the British Association at Glasgow may elicit from Mr. Buchan the result of his laborious investigations. I own that I am not only anxious to ascertain if his views coincide with my own,[1] but desire very much to have at my command the thorough discussion of the data for the eighty-six stations which Mr. Buchan has collected.

So far as a correct explanation of the inequalities is concerned, I believe it must be one that can dispense with the lateral movements of the air proposed by Mr. Blanford, and be applicable alike during the calm days of the "doldrums," and during periods of great wind disturbance. It must explain, too, seasonal differences in their amount, and we may infer that what will explain a seasonal difference will probably explain also a geographical difference of the same kind.

In the barometric co-efficients for Calcutta, supplied by Mr. Blanford, the semicircular one U' is nearly twice as great in April as it is in July, and the quadrantal co-efficient U'' is one third greater in March than it is in June. The hour angle u' does not vary so much as it does in this country, and the angle u'' shows its usual very remarkable constancy. In England the co-efficient U'' seems to have a greater proportionate range than at Calcutta. This will be seen by the following monthly means obtained from Mr. Main's discussion of the observations made at the Radcliffe Observatory, Oxford.

Mean Daily Quadrantal Oscillation of the Barometer for each month at Oxford for the sixteen years, 1858-1873 inclusive. In units of '0001 of an inch :—

March	... ...	120	September	...	120
April	... ...	118	October ...	...	109
May	... ...	101	November	...	90
June	... ...	98	December	...	92
July	... ...	94	January ...	...	74
August	... ...	108	February ...	...	111

The epochs of maximum effect seem here to correspond with the greatest thermometric range rather than with epochs of greatest heat. I think it will also be found in this country that this inequality is as large, if not larger, during continuous strong westerly winds as during quiet anticyclonic periods.

Like Mr. Blanford I was led to this subject by a study of the daily inequalities of the wind. My having arrived at a very different result must be my excuse for pointing out what seem to me to be points of difference between the conditions which he theoretically investigates and those which exist in nature. Mr. Blanford shows that "when a given quantity of heat is employed in heating dry air at the temperature of 80°, it raises its pressure more than seven times as much as when it simply charges it with vapour without altering the temperature." Mr. Blanford very properly premises that this occurs "while the volume remains constant." It is also implied that the volumes of air are of equal tension throughout. But where do these conditions obtain in volumes of the atmosphere? Such a volume, for example, as rests on a square yard, a square mile, or a hundred square miles of the earth's surface. This volume may easily be supposed to remain perfectly constant, while the tension of its parts may vary enormously. No ordinary addition of heat to the base of this volume will increase its total weight or sensibly add to the tension of the air at the surface of the earth. The added heat will alter the relative tension of portions of the lower third or half of the volume, and will be expended in raising to a small extent the centre of gravity of the whole. When this is done, that is, when the dynamical effect of the added heat is completed, the barometer at the base of the volume of the atmosphere will in reality read a little lower, instead of showing the greater tension required by Mr. Blanford's investigation. And this will be the case whether the added heat has expanded dry air only, or has evaporated particles of water already in the atmosphere. In either case I apprehend that during the upward movement of the warm air or of the *lighter* vapour the barometer would read lower than at the moment when the movement was completed.

An elevation of the centre of gravity of the atmosphere equal to two-thirds of a mile, barometer at 30 inches, would reduce the weight of the atmosphere by about the one-hundredth of an inch. The centre of gravity of the air over an elevated station like Leh in Ladakh would have to be raised several miles to produce so large a change of pressure as ·1034 of an inch, the difference between the maximum night and day value of co-efficient U' as given by Mr. Blanford—so many miles as, in my opinion, to compel me to look for some other cause for the production of part of the observed effect, and that cause, I believe, will be found in the dynamical one already indicated.

W. W. RUNDELL

[1] On the Diurnal Inequalities of the Barometer and Thermometer. *Quarterly Journal of the Meteorological Society*, Oct., 1874

Visual Phenomena

ALTHOUGH most people are familiar with the appearances which surround, or perhaps I should say form, the image on the retina of a luminous point, their origin, I believe, is not so generally known, and it is not uncommon to hear them ascribed to reflection from the eyelids and eyelashes, which in reality plays no part in their production. There are three distinct phenomena which go to make up the appearance of a luminous point, but they are not generally all visible at once. I will describe them for convenience of reference as phenomena A, B, and C.

(A). The luminous point appears to be surrounded by short rays, seldom more than a degree in length, generally much less, the length depending on the brightness of the point and the size of the pupil at the time.

These rays are what make a bright point look star-shaped (Fig. 1).

(B). Upwards and downwards from the point proceed two bundles of rays, each often 20° or more in length, and inclined to one another at an obtuse angle (Fig. 2).

Fig. 1

Fig. 2

(C). Coloured rays such as are shown in Fig. 3, which are only seen when the eyelids are nearly closed.

These perhaps it is hardly necessary to say are produced by diffraction through the eyelashes.

(B) is due to refraction through the small band of tears, which is retained by capillarity in the angle between the inner edge of the eyelid and the eye (shown at t and t', Fig. 4), and which acts as a curved prism, although its effect is only visible when the lids are advanced far enough over the cornea to allow light which passes close to them to enter the pupil.

The following simple experiments show that this explanation is the right one.

1. While looking at a bright point so as to see (B), draw down the lower eyelid, the upper bundle of rays will then disappear. This shows that the upper rays are caused by the lower eyelid, and also that as the image on the retina is inverted, the light must take some such course as shown by the dotted lines in Fig. 5. Now in no conceivable way could reflection from the

lower eyelid produce this effect, whilst it is evident that a prism of the shape taken by the liquid in the angle must produce it.

2. If the bright point be examined in front of a looking-glass, so that the eye, its reflection, and the point are in a straight line, it will be found that (B) does not begin to be visible till the eyelid is just beginning to eclipse the pupil, showing that it is the light which grazes the lid that produces the effect. I have accurately reproduced the phenomenon by fitting a lens of short focus

Fig. 3

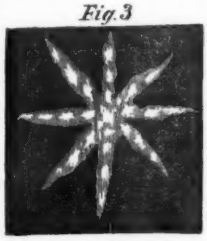
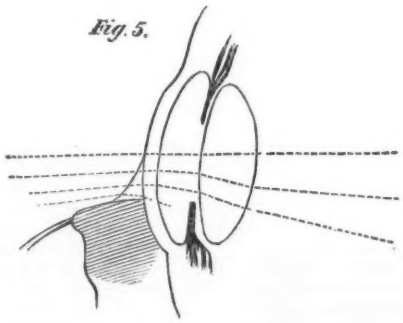


Fig. 4

into a pair of artificial eyelids, moistening the angle between the lens and lid, and photographing a bright point with the combination thus made. The diffraction effect (C) was also reproduced in this manner when the lids were brought close together.

The phenomenon (A) may be studied in the following manner:—Throw into the eye, by means of a lens or mirror, a pencil of light so widely divergent as to form a luminous patch on the retina, whose border is the shadow of the iris. If the pencil

Fig. 5.



proceed from a point, this border is well defined and dust on the cornea and any small irregularities in the distribution of moisture on its surface are rendered clearly visible by the diffraction rings and bands which surround their shadows. But what is most striking is the star-shaped figure (Fig. 6) which occupies the whole lighted area.

Fig. 6.

If now the divergence of the pencil be gradually diminished, which it may be by withdrawing the eye further from the focus of the lens, this area diminishes in size and increases in brightness towards the centre, leaving, however, the rays of the star still bright, and protruding into the region which has now become unilluminated; and when the luminous point is far enough off to enable the eye to focus rays proceeding from it, the phenomenon (A) is seen to be the limiting form of this star-shaped figure. The rays in the figure correspond with the stellate structure of the crystalline lens, to which, therefore, I conclude that (A) is due.

ARNULPH MALLOCK

Antedated Books

As Editor of the Zoological Society's *Transactions*, I must maintain, in direct opposition to "Another F.Z.S.," that we set a *good*, and not a *bad*, example in dating our books. The parts of the *Transactions* not being issued at regular dates, I have adopted the plan of placing the date at which the paper is going finally through the press at the foot of each sheet, for the very purpose of giving its correct date as nearly as possible. The part is always on sale within a month at least, I think I may say, after this date; so that this date and that of publication are to all practical purposes identical.

P. L. SCLATER,
Secretary to the Zoological Society of London

Aug. 22

MR. R. BOWDLER SHARPE makes a singular defence to my comments on his "evil practice" of issuing, in August, 1876, a work dated on the cover May, 1875. He says that if I had looked into the interior I should have found "abundant evidence" to convince me that the date on the cover was a false one. Seeing that when I wrote my former letter I had only just received the number from the publishers, I had no need to search for further evidence of such being the fact. Mr. Sharpe must be aware that the covers of works issued in parts are often bound up for the express purpose of preserving a record of the date of issue. How will this plan operate in the case of the second edition of the "Birds of Africa?"

"Another F.Z.S." states that in his copy the date "May, 1875" has a line drawn through it. This is not the case with my copy, nor is it so in others which I have examined.

F.Z.S.

Kerguelen's Land

IF Mr. R. Bowdler Sharpe considers that, having published a description of the new Teal from Kerguelen's Land, he has done all that is necessary in relation to the collection of birds made by Mr. Eaton in that distant island, he will, I fear, find but few persons to agree with him. Most of his brother naturalists will side with me that our American friends have shown much greater energy in getting out a complete account of the ornithology of this interesting island at an early date than Mr. Sharpe in issuing a short notice of the single undescribed species.

THE REVIEWER OF "THE BIRDS OF KERGUELEN'S LAND"

A Large Meteor

I HAVE just seen a large meteor. It fell vertically in a line passing half-way between the pole-star and the nearer pointer, disappearing about 15° above the horizon. Where it came from I did not see. At disappearance it seemed a very elongated pear-shape, and changed colour from red to violet (commencing at the edges). Its horizontal diameter was about 20'. Time 8.10 P.M. about; my point of view, 4 miles due south of the dome of St. Paul's.

I may add, that on the night of Thursday, 10th, between half-past 11 and 1, while on a long drive in the neighbourhood of York, and looking up at the clear sky only as circumstances permitted, I counted twenty, and saw more, the moon shining brightly at the time.

RICHARD VERDON

London, Aug. 21

[Mr. Paul Robin, writing from Sheerness, states that on Monday evening, at 8.10 P.M., he saw a meteor brighter than Jupiter, with a white luminous train of about 5 deg. Its course crossed a line from the pole-star, joining the pointers.]

THE "CHALLENGER" EXPEDITION

WE have already published (vol. xiv. p. 197) the weighty testimony borne to the value of the *Challenger* Expedition by the leaders of science in Vienna. The following no less valuable address to Sir C. Wyville Thomson has been sent us for publication:—

To Prof. Sir C. Wyville Thomson, F.R.S., Director of the Civilian Staff of the "Challenger" Expedition, Edinburgh.

R. Museo di Fisica e Storia Naturale di Firenze,
Florence, July 7, 1876

SIR,—The professors of the Natural Science Section of the Royal Institute of Florence have followed with the most intense interest the researches on the deep-sea fauna initiated by you during the *Lightning* and *Porcupine* expeditions, and so splendidly followed up during the voyage round the world of the *Challenger*. With anxious expectation we have followed the

results of your dredgings across the great ocean-basins of both hemispheres, and now that you and your able assistants have completed your great task so satisfactorily and are safely returned, we beg you to accept our most hearty congratulations and the expression of our united sentiments of admiration ; for you have, indeed, revealed a New World to Biological Science and opened a new and most important field for physical research.

PH. PARLATORE,
AD. TARGIONI-TOZZETTI, Prof. of Zool. and Comp. Anat.,
A. GLEGNI,
ENRICO HILLYER GIGLIOLI, Prof. of Zool. and Comp. Anat. Vertebrates,
Dr. GUELFO CAVANNA,
MGR. GUISEPPE GRATTAROLA (Mineralogy),
Prof. PIETRO MARCHI,
GIOVANNI ARCANGELI (Cryptogamic Botany).

The following is Sir C. Wyville Thomson's reply to the above :—

To the Professors of the Natural Science Section of the Royal Institute of Florence.

20, Palmerston Place, Edinburgh, Aug. 12, 1876

GENTLEMEN,—Allow me in my own name and in that of my colleagues on the Civilian Scientific Staff on board the *Challenger* to thank you most cordially for your kind letter of congratulation on our return to England, and on the success of our labours.

Owing chiefly to the manner in which throughout the whole of this undertaking the Admiralty have uniformly accorded the first place to the purely scientific work, and to the heartiness with which the objects of the scientific specialists have been seconded by the naval officers on board, we have certainly been enabled to carry out our investigations almost more fully and completely than we had a right to hope. We are well aware, however, that we have only now entered upon the most difficult if not the most important part of our task, and I can only say that we will do all in our power to justify the liberal encouragement which we have received from Government by working out fully the mass of data and materials which we have accumulated, and publishing our results as soon as possible in an appropriate form.

I need scarcely add how great a gratification it has been to us to receive assurances of sympathy and approval from so many of our most distinguished fellow-workers, but it seems to me that such assurances are more specially welcome from Italy, the wonderful country whose language and modes of thought have been before us as a model from our childhood, and which perhaps above all others commands our interest and regard.

I have the honour to be, Gentlemen,
Yours gratefully and respectfully,
C. WYVILLE THOMSON

A CONTRIBUTION TO THE NATURAL HISTORY OF THE HERRING

THE Meteorological Society of Scotland has made an important contribution to the natural history of the herring (*Clupea harengus*), the capricious movements of which have recently attracted attention and been discussed in the columns of NATURE. It is often asserted by the more observant persons who assist in the capture of the herring, that the *Clupea* family are lovers of very cold water, and it is, doubtless, from a knowledge of this fact, that the story of the herring being a native of the Arctic regions took its rise. Pennant's tale of these fish coming annually in a vast *heer* from the high latitude of the northern seas has been discussed and settled again and again. There need now be no hesitation in saying that Pennant erred ; indeed, he only gave literary life to the fables of the fishermen, and, so far as we know, he made no personal effort to determine whether or not the herring was a migratory fish. It has been ascertained beyond doubt that the herring is a local animal, the different varieties of which can readily be identified. Dealers or fishermen are able to distinguish between a Loch Fyne herring and one captured in the Frith of Forth or in the Bay of Wick, or any other sea or frith. As a matter of fact, the herring is found on British shores all the year round, and there is no authority for supposing that the varieties taken in different localities are members of any great general body of these fish, or that there is one great shoal in existence every year, which, at a certain season divides and then subdivides itself, *à la* Pennant.

To come back, however, to the new discovery. We are indebted to the Meteorological Society of Scotland for some interesting experiments which have been made as to the temperature of the waters in which the herring can live with the greatest amount of comfort to itself, and, when known, with the greatest benefit to its captors. It has been determined by the experiments of the Society that the take of herrings is most abundant where the temperature of the sea is lowest. It was found in 1874 and 1875 that "the temperature of the sea, off the east coast of Scotland, from the middle of August to the close of the fishing season, was continuously and considerably higher in 1875 than in 1874, and that the catch of herrings was continuously and considerably lower during 1875 than during the same period of 1874." As regards the difference between surface and bottom temperature and their relation to the fishery, it has been noted that when the temperature of the surface of the sea is high, the fish are found in the deeper parts of the water. "The fish prefer, apparently, so far as the inquiry has gone, the lower to the higher temperature." When a thunder-storm has prevailed on any of the days devoted to the fishing a good take of herrings may be expected by the fishermen, "but, on the following day, few, if any fish are caught over that part of the coast, *unless at the extreme verge of a deep part of the sea* as if the fish were retreating thither." The Meteorological Society of Scotland are desirous of extending their inquiries and observations, and they wish the fishermen to aid the inquiry by taking the trouble of "observing the temperature of the sea at the surface and also at the depth at which the fish strike the nets." In other countries than ours observations of a relative kind to those prosecuted by the Scottish Meteorological Society of Scotland have been successfully accomplished. The Dutch have ascertained many interesting facts regarding the effects of temperature on fisheries. The Norwegians have also been prosecuting similar inquiries. Herr von Freeden, of Hamburg, Director of the German Seewarte, has also made observations, both as regards temperature and direction of wind. As regards the latter, he has come to the conclusion that north-west winds are the best for large catches, and northerly winds better than southerly, westerly better than easterly ; also, that moderately strong winds, sufficient to ruffle the surface of the sea, are better than calm weather, and light winds almost as unfavourable as stiff breezes ; a ruffling of the sea being in his opinion of considerable importance to success of fishing.

These are important discoveries, so far as they go, and must ultimately exercise considerable influence on the practice and results of the herring fishery. Hitherto the men have fished as in the dark, so far as regards the kind of knowledge which has just been found for them. That the month of August is a good time to seek the herring is about all that fishermen do know ; the most likely part of the water in which to find them, or the depth at which they may be lying, they cannot tell. When the fishermen *shoot* their nets they may not fall in the path of the fish ; the herrings they seek may be either above or below the snare which the men have let into the water for their destruction. By a fruitful continuance of the observations we have referred to, we shall be able to conduct the herring fishery with greater exactitude and likewise with more economy of time.

TELEPHONES AND OTHER APPLICATIONS OF ELECTRICITY

IN a recent number we gave some account of the telephone of Mr. Elisha Gray; in the present article we propose to refer to another form of this instrument, as also to the so-called electric telegraph without conductors, and its relation to electric tuning-forks. For our information, as well as for the illustrations, we are indebted to papers by M. Ch. Bontemps, in our French contemporary, *La Nature*. To begin with the last-mentioned application of electricity.

For this new process of telegraphy it is claimed that we may communicate with any person at any distance without having taken the precaution of previously establishing a continuous wire between the two stations.

M. Bourbouze, in 1870, in continuation of previous experiments, attempted at Paris to utilise the Seine as a conductor between two stations, the Jena and Austerlitz bridges. This attempt, if successful, would then have been of great practical value, as it would have enabled besieged Paris to communicate with the outside world. An electric pile placed on the Jena bridge sent alternative currents to Austerlitz bridge. These currents were received in a galvanometer invented by M. Bourbouze, and read by the oscillation of the needle to right or left. The experiment appeared successful; the elements of a language were proved in this attempt. There was no opportunity, however, of further testing its utility; a mission was organised for the purpose of establishing a station beyond the lines, but ere it could be carried out the armistice rendered further experiment unnecessary. M. Bourbouze has, however, again taken the matter up; but it is necessary to be on our guard against cherishing hopes which seem premature.

M. de Parville points out very well the objection which common sense suggests. "Suppose," he says, "that we should all wish to speak by this means from one end of a city to the other. Each possesses his talking-needle and his pile. Each needle goes marching ceaselessly to right, to left, obeying everybody at once. It will speak for all correspondents at the same time. Messages will get entangled and completely mixed up. Here is a new Tower of Babel. We won't be able any longer to understand each other. The electric wire of the ordinary telegraph, on the contrary, serves as a track of union, and shuts the door to indiscretions. Thus, *yes*, we may communicate to a distance without a wire; *no*, we should not be able to supply by this new system, since we should find ourselves in the condition of a crowd speaking at once miscellaneously, without being able to make itself understood. For the new system to become applicable, it would be necessary to find the means of giving to each current an individuality which would enable a correspondent to recognise it among the thousands of currents which may circulate at one time. We have no right to doubt the future, and we may hope that some day such a means will be discovered."

In this connection let us explain the remarkable work of a Danish engineer, M. Paul Lacour. How can we give to each current an individuality which will enable us to recognise it?

When we consider the most common acoustical phenomena, for example, the transmission of an air played by an orchestra, which is perceived by all the audience at considerable distances from the executants, we have some difficulty in analysing this effect. Physics tells us that the sounds produced by each instrument have their proper tone and their distinct measure; in other words, the notes which come from a violin, a flute, a trombone, correspond to different vibrations transmitted by the atmosphere and characteristic of each note. Besides, the rhythm in the succession of the notes, which makes the measure in music, produces the cadence, constituting with the tonality and the timbre of the instruments the general effect of the air which impresses itself upon us. The transmission is so precise that an ear detects in this assembly of performers a mistimed note, anything out of tune in the midst of the harmony of the air. In our exposition it is the mistimed note which will serve us as a landmark.

Suppose a series of three tuning-forks vibrating continuously and producing—the first, 100 vibrations per second; the second, 300; and the third, 500. It is easy to conceive that each of these tuning-forks may interrupt and establish an electric current with intermissions regulated by the number of its vibrations. If we have three tuning-forks identical with the three former, we can conceive each group to be placed at the extremity of an electric line serving as a medium of connection. We shall see reproduced the phenomenon of the musical air transmitted to a distance: the three transmitting tuning-forks act respectively on the three receiving forks by means of the medium which connects them.

Let us admit, meantime, that by an effort of the will we may either set a-going or stop any one of these tuning-forks in accordance with a cadence that will not necessarily coincide with its regular action, we shall find at the other extremity in the symmetry of the perturbed instrument, the same discordant manifestations. The mistimed note will be as faithfully transmitted as the harmonic vibrations. The bearing of a practical realisation of this conception will be easily understood; it opens the way to the indefinite multiplication of diverse transmission by the same conductor; it is also the germ of a solution of transmission by multiple conductors, with the power of individualising each current.

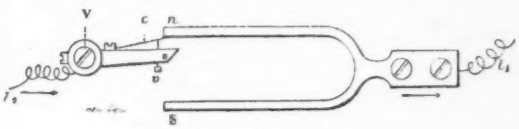


FIG. 1.—Transmitting tuning-fork.

What is necessary to the fulfilment of this condition? 1. It is necessary to construct tuning-forks whose movement is maintained by an electric current; this problem has been solved. 2. It is necessary that these forks emit currents whose phases correspond exactly with their movement, a problem which has also been solved. 3. Finally, we must be able, in a very small interval of time, say one second, to arrest and put in action a great number of times (100 at least) each of these forks. This last point is the only one which presents any difficulty. We see that this difficulty is only a problem of construction; it is necessary to operate with very small masses in order easily to overcome inertia. The success of M. Marcel Deprez authorises us in thinking that the third condition may be realised.

We shall conclude this part of the subject by a reference to figures. We shall show how a diapason vibrating continuously can send currents of the same intermittence along an electric line. Fig. 1 represents the necessary apparatus. The arm *n* of the tuning-fork encounters alternately the platinum of the tongue *c*, whose opening is regulated by the screw *v*. A current entering by l_2 is closed every time that the extremity *n* touches the slip *c*, and is opened when the vibration of the tuning-fork is away from the extremity *n*; there is only required for this that by the wire l_1 issuing by the exterior conductor, the line, there be propagated a series of electric undulations reproduced exactly in the material vibrations of the arm of the tuning-fork.

We have, however, to show how we can determine and mark the character of an intermittent current arriving by the telegraphic wire. Fig. 2 represents the arrangement

of the intermediate station traversed by the line L L; A, B, C are three tuning-forks similar to those of the transmitting station. The fork B, for example, which is in unison with the current, will enter into vibration while the others remain mute. This fork B will then touch the platinum tongue (shown in Fig. 3), and there will be established in the circuit $b\,b'$ a local current of the pile U whose poles are applied respectively to a, b, c, and to a', b', c'. This local current will be intermittent in proportion to the time of the tuning-fork, but on account of the rapidity of the pulsations it will show itself in many cases as a constant current either by effecting chemical decomposition, by causing the deviation of an electric needle, or by energising an electro-magnet.

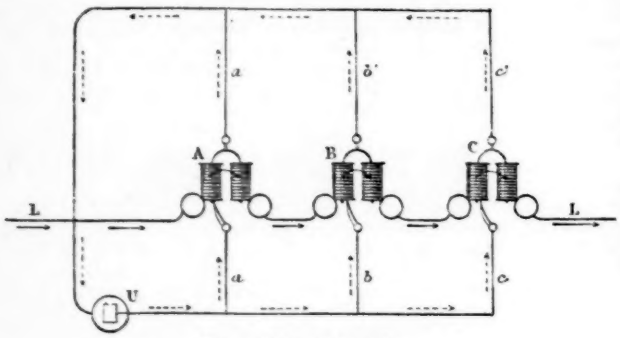


FIG. 2.—Intermediate station.

Fig. 3 shows the arrangement which has been established to produce interruptions for correspondence by means of the regulated vibrations of the tuning-fork. The manipulator C, which can oscillate around a central axis, rests sometimes on c' sometimes on c''. Acording as the lever C is supported on c' or c'', it closes the circuit of the intermittent current emitted by the tuning-fork, either by the earth of the transmitting station or by the earth of the receiving station, after traversing the guiding wire.

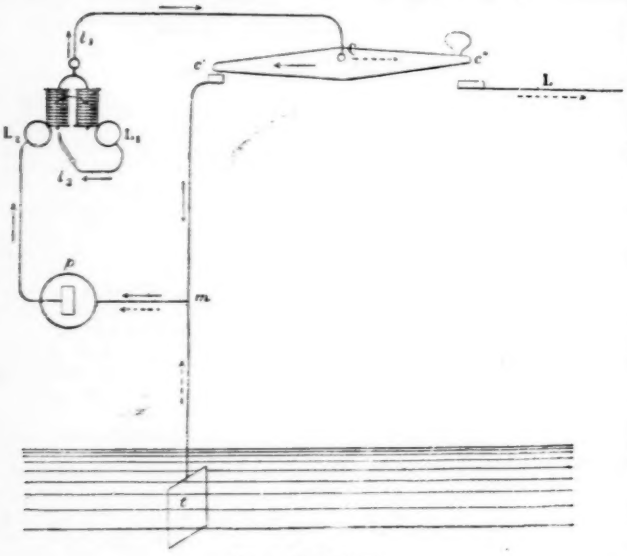


FIG. 3.—Manipulator.

It would seem, then, that the only objection to the practical realisation of the system of multiplying correspondence in one or more directions, lies in the greater or less facility with which a tuning-fork can be stopped and put in action; it is a question of mass, and cunning fingers will certainly some day devise for us apparatus sufficiently small to realise this desideratum.

With regard to the telephone, an instrument allied in some respects to the apparatus above referred to, we shall specially refer here to that which bears the name of M. Reuss. For an account of Mr. Gray's instrument, see vol. xiv., p. 30. The arrangement adopted by M. Reuss will be seen in Figs. 4 and 5—the former representing the transmitting apparatus, and the latter the receiving apparatus.

At the station at which the musical air is played (Fig. 4) a wide tube T issuing from a box K receives the vibrations of air produced by the instrument. The purpose of the box is to collect and strengthen the sound. On the upper part is stretched a membrane m, which vibrates in unison with the impulses it receives. To transform the movements of this membrane into the harmonious emissions and interruptions of an electric current, it is sufficient to establish a series of connections easy to conceive.

Suppose that a pile, one of whose poles is the earth, is attached by the other electrode to a handle marked 2 in Fig. 4; from this a metallic conductor formed by a thin plate of copper i and ending in a disc of platinum o, leads the current in front of a point borne by the lever $a\,b\,c$. Every time that the membrane m is raised, the point touching the disc, the current will be established; on the other hand it will be broken when the membrane returns to its normal state. The box K is represented cut away at the upper part in order to show the arrangement of the membrane and the electric communication which repeats the vibrations. In order to transmit to any distance 100, 200, 500 kilometres the electric current, it is necessary that a line should issue from the knob 1 (Fig. 1), and be attached to knob 3 (Fig. 2, which represents the receiving apparatus). The latter is formed by an iron rod $d\,d$, around which is rolled insulated copper wire, one extremity of which ends at the knob 3, and the other in the earth by the screw 4, for the purpose of completing the circuit of the pile of the issuing station. The rod, $d\,d$, is of the size of a knitting-needle; the coil, g, formed by the combined wire and rod, is supported on a box, B, having very thin sides; above is the lid, D. The object of the whole arrangement is to strengthen the vibrations which are produced by the successive interruptions of the current across the rod, $d\,d$.

What is noteworthy in this system is that the vibrations of the rod, $d\,d$, are exactly synchronous with those of the membrane, m, and consequently with those of the instrument, the air from which has been played in the tub, T. Not only is the measure indicated, but the tonality as well, the two elements which make up the melody, height of sound, and interval of notes, all is reproduced automatically without possibility of error.

To complete the description, we must add that there is on Fig. 1, a lever, ts, and an electro-magnet, E E, the ordinary appendages of a Morse telegraph. Also on Fig. 2 is seen the manipulatory lever; there is also a receiver, not represented in the figure.

In order to appreciate the full value of the telephone, it is necessary to examine the form given to the box, K; the best arrangement hitherto discovered consists in bending the sides so as to amplify the effect on the mem-

brane by successive reflections. The power of the receiver is also increased by the introduction into the coil of several rods of iron; the sound originally somewhat snuffling, thus acquires a more agreeable tone.

M. Reuss calls the attention of physicists to the experiment; we think, with him, that there is here the germ of notable improvements to be made on the electric telegraph.

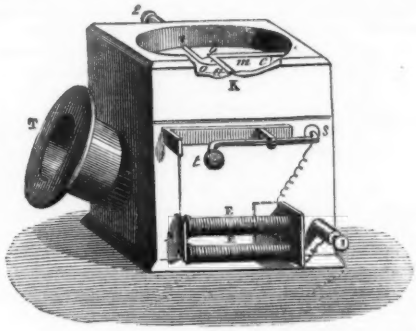


FIG. 4.—Sending apparatus.—K, box to collect the vibrations; *m*, caoutchouc membrane closing the box; *o*, platinum disc fixed to the membrane; *a b c*, movable lever, supported by the point on the membrane; *t s*, manipulating keys for correspondence; E E, receiving electromagnet for correspondence; 2-1, screws to attach the communicating wires to the pile and with the line.

We do not, however, believe that in its present state, the invention is so complete that we can, at a distance, repeat on one or more pianos the air played by a similar instrument at the point of departure. There is a possibility here, we must admit, of a curious use of electricity. When we are going to have a dancing-party, there will

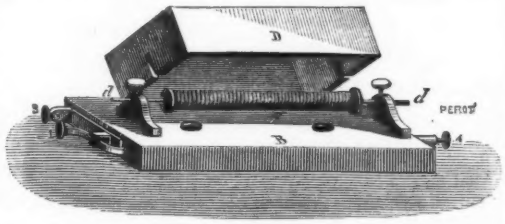


FIG. 5.—Receiving apparatus.—B, box to strengthen the vibrations; D, lid of this box; *d d*, iron wire vibrating by the passage of the current; *g*, coil through which the current passes; *t' s'*, manipulating key for correspondence; 1, 2, 3, screws to attach the communicating wires to the pile and to the line.

be no need to provide a musician. By paying a subscription to some enterprising individual, who will, no doubt, come forward to work this vein, we can have from him, a waltz, a quadrille, or a galop, just as we may desire. Simply turn a bell-handle, as we do the cock of a water or gas-pipe, and we shall be supplied with what we want. Perhaps our children may find the thing simple enough.

INTERNATIONAL CONGRESS OF AMERICANISTS.

LAST July there met in the city of Nancy a congress of a somewhat novel kind (NATURE, vol. xii. p. 319) which, at the time, did not attract very much attention, but which, during its four days' sitting, did a considerable amount of work of varied value. This was the International Congress of Americanists, organised by a society recently formed in France under the designation "La Société Americaine de France." The society itself appears to be French, though the congresses are intended to be international in their character, and among those who were members of the last congress (though not necessarily present) were many eminent men belonging to all parts of the world. Among English names we notice those of Dr. Birch, Mr. Charles Darwin, Mr. Franks, Sir John Lubbock, Mr. R. H. Major, Prof. Max Müller, Sir Henry Rawlinson, Sir Charles Trevelyan, Mr. Trübner, and others. Delegates from various countries were present at the congress, and although most of the papers were by Frenchmen, still a fair proportion were by foreigners, chiefly Americans and Scandinavians. Two thick octavo volumes[1] contain the proceedings of the congress.

The object of this French society in holding these congresses is to contribute to the progress of ethnographical, linguistic, and historical studies relative to the two Americas, especially for the times anterior to Christopher Columbus, and to bring into connection with each other persons who are interested in these studies. The subscription is only twelve francs, and the council is composed of a certain proportion of French and of foreign members. The president of the Nancy congress was the Baron de Dumast, but at each of the four *séances* for the reading of papers he very gracefully called to the chair a distinguished foreign member to preside over the day's proceedings. During the congress an interesting exhibition of objects relating to American ethnography and antiquities was held.

The subjects with which the congress dealt were divided into three sections—History, Ethnography, and Linguistics and Palæography, though, as might be surmised, many of the papers bore on all these subjects. Though the subjects were thus divided, the congress met as one body each day.

Such an international congress as this, it will be admitted, might do great service to science. The ethnography and prehistoric archæology of America are of the highest importance; they are a prime factor in the great problem of the world's ethnography. If, then, an international American congress were based on well-defined principles, and if its work were conducted in accordance with the universally recognised rules of scientific method, it might give a powerful impulse to the progress of American ethnology in particular, and to ethnography in general. We shall briefly endeavour to give the reader an idea of the value of the contents of the two volumes before us.

Among the first papers is one of considerable length, by M. E. Beauvois, the purpose of which is to prove that the "Irland it mikla," or "Hvitramannaland" of the early Icelandic chroniclers was a colony founded by Irish m ssionaries, apparently near the mouth of the St. Lawrence, long before even the Norseman knew anything of America. One cannot but admire the learning, ingenuity, and enthusiasm of M. Beauvois, but the verdict must be the Scotch one of "not proven," with a note that it was scarcely worth while calling together an international congress to listen to a paper of this kind.

This may be regarded as a type, and rather a favourable one, of a large number of the papers read at the Nancy congress, papers whose object was to show the intimate connection which in prehistoric times existed between the peoples of the Old World and those of the New. A paper by Prof. Paul Gaffarel of Dijon, for example, had for its object to show the great probability that the Phœnicians had found their way across the Atlantic to America, North and South, and that in various ways they left traces of their presence behind. This is a somewhat more sober paper than that of M. Beauvois, still the verdict must be essentially the same.

Of course the questions of Buddhists in America and of "Fu-Sang" got their share of attention, with the usual

[1] Congrès International des Américanistes. Compte-Rendu de la Premiere Session, Nancy, 1875. (Paris, Maisonneuve et Cie.)

unsatisfactory result. Fortunately there were some solid men at the congress who were able to perceive the utter futility of discussions of this kind. M. de Rosny, for example, had frequent occasion to recall the attention of the congress to its main purpose, and to remind the members that while we knew comparatively so little of the American aborigines and of their remains, it was a waste of time and energy to discuss the civilisation of any other country. "Our duty," he said, "is to establish formally, against all the crotchets which have hitherto infested the domain of Americanism, a method. Every hypothesis which is not based on certain proofs is of no scientific value;" and Dr. Dally justly remarked that there is no special "Americanist method," but that there is a scientific method, whose rules are quite sufficient for this new department of science. "No documents," Dr. Dally continued, "are adduced in support of these connections between the Old and the New Worlds; we must, therefore, provisionally consider them as non-existent. All the alleged analogies are only vain appearances. The presumptions are, on the contrary, against the hypotheses of an analogy or a filiation between the religions of Mexico or of Peru and those of Eastern Asia. The solution of the question is that the Americans are neither Indians, Phœnicians, Chinese, nor Europeans; they are Americans." "All these hypotheses," M. de Rosny remarked again, "of Asiatic influences in America are very piquant: it is the proof which is always wanting." What a pity a few men like M. de Rosny and Dr. Dally were not appointed beforehand to decide on what papers were deserving of the serious attention of the congress! However, wisdom comes by experience. The fairly moderate paper on Fu-Sang, by M. Lucien Adam, might have been admitted, as might also that of M. Gravier on the Deighton Rock inscription, but we are sure that all the papers thus admitted could have been published in one-third of the space of these two volumes.

M. Lévy-Bing brought much learning to bear on the Grave Creek inscription for the purpose of proving it to be Phœnician, with the usual unsatisfactory result, we are sure, on all unbiased listeners. Perhaps the most deliberate and cold-blooded attempt to prove an intimate connection between America and Old World civilisation was made by Prof. Campbell, of the Theological College, Montreal, in his paper, "The Traditions of the Ancient Races of Peru and Mexico identified with those of the Historical Peoples of the Old World." His object is to prove that the Peruvians and Mexicans had "their original home on the banks of the Nile, and that their traditions relate primarily to an early national existence either in Egypt or the neighbouring region of Palestine;" and besides various other conclusions, "that there is the strongest reason for finding the affinities of the civilised races of ancient America, not among the Turanian or Semitic, but among the Aryan or Indo-European families of the world." This is rushing to a conclusion with a vengeance, and some of the more sober members of the congress had good reason to animadvert on the "haste to conclude" manifested by many of the Americanists, and the want of patience to wait for more light. An idea of the value of the "facts" on which Prof. Campbell builds his sweeping conclusions may be gathered from the following extracts:—"Animal worship prevailed in Peru, and it is worthy of note that flies, called *cuspi* (a word of the same origin as the Semitic *zebub*, the Latin *vespa*, and the English *wasp*) were offered in sacrifice, thus recalling the *Baal-zebub* of the *Phili-sheth*." "In *Manco* I find the first monarch of universal history, the Egyptian *Menes*, the Indian *Menu*, the Greek *Minos*, the Phrygian *Manis*, the Lydian *Macon*, the German *Mannus*, the Welsh *Menev*, the Chinese *Ming-ti*, and the Algonquin *Manitou*"—and so on through endless ingenuities. Is not this comparative philology playing at "high jinks?" and is it not one more striking proof that to trust to language alone in questions of ethnography is to trust to a chain of sand?

While the Baron de Bretton's paper on the Origins of the Peoples of America contains some suggestions of value, it also, like the one just mentioned, is disfigured by many etymological fantasies. It is quite legitimate to try to show that America may have been in part peopled from Europe, but to base such a theory on arguments like the following makes one almost despair of the progress of scientific method:—"The first invaders from whom, according to the tradition of the Toltecs, that people were descended, were called *Tans*, *Dans* (Danes!). Their god, *Teoti*, strongly resembles linguistically the Greek *theos*, Latin *deus*," &c. The temples of this god were called *tescabli*, "a word which comes from Greek *theos* and Celtic *ca-cas*, house." A god, *Votan*, is probably *Wodin*, and *Thara*, *Thor-as Asa-thor*. *Azlan*, the supposed original home of the Aztecs, is, according to Baron de Bretton, evidently Scandinavian *Asaland*, country of the *Ases*, of the *Asiatics*, of the *Aztecs* themselves. What answer can be made to such etymological legerdemain?

The Abbé Petitot has been for many years a zealous missionary in the Athabasca-Mackenzie region of North America, and has made some valuable contributions to a knowledge of the geography of that region; not content with this, however, he is eager through the medium of language to prove the unity of origin of the human race. He argues that because certain North American Indian words have a more or less distant resemblance to Chinese, Malay, Tamul, Hebrew, Greek, Latin, Japanese, German, English, &c., therefore all these are descended from one common stock. We shall give only one specimen of the Abbé's easy-going comparisons: English *each*, he tells us, is the same word as Hebrew *isch*. He gives pages of this sort of thing. It is easily done; any ignoramus with the dictionary of a dozen different languages before him could do it. The "Tower of Babel" is the Abbé's starting-point in tracing the diversities of human speech.

It seems to us a pity that the reputation of an international congress that might do much good should be endangered by puerilities such as those we have referred to. We hope that in this their first meeting the froth has come to the surface, and that in future meetings means will be taken to prevent middle-age word-puzzles being foisted on the congress.

The two volumes, however, contain some papers of real value; these we have space only to name. Prof. Luciano Cordeiro's (of Coimbra) paper on the part taken by the Portuguese in the discovery of America is of considerable interest, and shows great research. A paper by M. Paul Broca on two series of crania from ancient Indian sepulchres in the neighbourhood of Bogota is a model of careful observation and reasoning. M. J. Ballet, of Guadaloupe, has a long memoir on the Caribs, full of information. A paper by M. Julien Vinson on the Basque language and the American languages is able and scholarly and cautious. He shows that in structure and grammar they have many points of resemblance, but that on this ground there is no reason whatever for concluding that they or their speakers have a common origin. Other papers of value are Dr. Cornilliac's on the Anthropology of the Antilles, Mr. Francis A. Allen's on the Origin of the Primitive Civilisation of the New World, an elaborate paper, the result of great research, and M. Oscar Comettant's paper on music in America before the discovery of Columbus.

On the whole, we cannot think that these two volumes show that this International Congress of Americanists has done much in furtherance of the object for which it met, and we shall look with interest for the results of the second congress, which will meet at Luxembourg in September, 1877.

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF 1882, May 17.—The following elements of this eclipse depend upon the lunar tables of Damoiseau and the solar tables of Carlini, and are therefore not intended to be used in a calculation of the precise circumstances for any place. They will, nevertheless, serve to afford a better idea of the character of the eclipse near the central track than can be obtained from Hallaschka's map in his *Elementa Eclipsium*, where by an error of calculation the eclipse is shown *broadly annular*.

Conjunction in R.A., 1882, May 16, at 19h. 42m. 25s. G.M.T.

R.A.	...	53	56 53·3
Moon's hourly motion in R.A.	...		36 14·4
Sun's ,, ,, ,, ...	...		2 28·6
Moon's declination	...	19	38 41·9 N.
Sun's ,, ...	...	19	19 42·0 N.
Moon's hourly motion in decl.	...		36 14·4 N.
Sun's ,, ,, ,, ...	...		2 28·6 N.
Moon's horizontal parallax	...		58 15·1
Sun's ,, ,,	...		8·8
Moon's true semi-diameter	...		15 52·4
Sun's ,, ,,	...		15 48·8

The equation of time is 3m. 50s., subtractive from apparent, and the sidereal time at mean noon, May 17, 3h. 40m. 19 2s.

Instead, therefore, of being broadly annular, the eclipse will be narrowly total on the central belt.

	h. m.		
Central eclipse begins	17 55·0 in Long.	3 26 W.,	Lat. 10 32 N.
,, ,, at	noon ,,	63 27 E.,	,, 38 27 N.
,, ,, ends	21 20·8 ,,	138 29 E.,	,, 25 17 N.

The eclipse is total in Upper Egypt and the Peninsula of Sinai, points on the central line being 32° 25′ E., 26° 57′ N., and 34° 23′ E., 27° 57′ N.

These elements also give totality for about twenty seconds at Shanghai: middle at 5h. 21·2m., local mean time, sun's altitude, 17°.

COMETS OF 1847.—In the last number of the *Astronomische Nachrichten*, Dr. Schur, of the Observatory at Strasburg, has given definitive parabolic elements for the comet discovered by Schweizer at Moscow, on Aug. 31, and last seen at Pulkowa on Nov. 28—an isolated observation. Elliptical elements had been assigned to this body, but the more complete computation by Dr. Schur shows that there is no sensible deviation from the parabola.

Greater interest attaches to another comet of the same year—that detected on July 20, by Brorsen at Altona, which was observed by Rümker till Sept. 12. The observations can hardly yet be considered as having been thoroughly discussed, though it may be presumed that D'Arrest used the last Hamburg observation in calculating his second ellipse (*Ast. Nach.*, No. 662), and Dr. Gould investigated elements with the whole, or nearly the whole, of the observations before him.

D'Arrest, by his second calculation, found the period seventy-five years; Dr. Gould gave eighty-one years; hence this comet has been considered to form one of the singular group which appear to revolve in something less than the period of Uranus; it must, however, at present be regarded as the least certain of the number, with respect to length of revolution. It presents a case where, as Dr. Gould remarks, very small changes in the fundamental places, even the slight change of the parallax due to more accurate determination of the comet's distance is "sufficient to change materially the form of the resultant orbit and the period deduced." His final elements exhibit a decided preponderance of sign in the errors when compared with the August observations, though he appears to have suspected the cause to have been mainly the difficulty attending exact computation from the elements in such a case. The observations will be found in a collective form in his paper concluded in vol. i., No. 19, of the *Astronomical Journal*—a periodical, by the way, of which it is difficult now to procure complete sets. The greater number are also found in *Astronomische Nachrichten*, vol. xxvi. D'Arrest furnishes no particulars of his second calculation, but gives the elements the preference over his first set, in which the period of revolution was considerably longer.

A further calculation may possibly lead to a more definitive value for the major axis; at present it appears that when the comet is re-discovered it is likely to be by accident rather than from any approximate knowledge of the epoch of ensuing perihelion passage and organised search.

A still more worthy matter of investigation, however, is the orbit of Olbers' Comet of 1815, due, according to Bessel, in less than eleven years. It is pretty certain that, with the introduction of improved solar tables and star-places for new reduction of such original observations as we possess, the fundamental positions might furnish a still more reliable orbit for 1815, while the re-calculation of the perturbations from more exact values of the masses than were at Bessel's command, may lead to a nearer determination of the time of next perihelion passage, which he has fixed to 1887, February 9.

FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THIS year's Congress was opened at the Hôtel de Ville, Clermont, on Friday, August 18, under the presidency of Prof. Dumas, the well-known chemist and the perpetual secretary of the Academy of Sciences. M. Dumas praised in warm terms the spirit of individual initiative so largely developed in England, and he compared the British Association with her younger sister, the French Association. He spoke in high terms of English men of science, and referred to the Exhibition of 1851, and the important results which have followed it in the development of permanent scientific institutions in England. M. Dumas acknowledged the zeal of the French Government in helping science, and he showed that science must be promoted not only by benevolent and intelligent individuals, but also by the State. He, in eloquent terms, presented to the assembly the testimony of his long-continued labours extending over a period of more than sixty years, as a proof that science was conducive only to happiness. He advised men of science not to meddle either with theology or with philosophy, but to leave all questions in these regions in the hands of theologians and philosophers. The province open to science is large enough to give every satisfaction to the widest ambition.

The address was received with enthusiasm. The mayor of Clermont, M. Moinier, a barrister by profession, delivered a very sensible address, making allusion to the so-called "grands jours d'Auvergne," when many centuries ago legislators held their meetings in the very place where a parliament of science was then assembled. He said, moreover, that science, which was ignored in those days, was supposed now to have the duty of ruling the rulers of mankind.

M. Cornu then addressed the assembly on the present condition of the Association, which is eminently satisfactory. One of the most important announcements he had to make was that the Association, since its last meeting, has been recognised by Government as "of public utility," which is equivalent to the granting of a charter in England, and which will not only be of advantage to the Association, but, we believe, will enable the Association to be of greater benefit both to France and to science. To celebrate this episode in its history, M. d'Eichthal, to whose efforts it was largely owing that the privilege was

conferred, has presented the Association with a gift of 10,000 francs. The Association has been able to distribute assistance to those engaged in scientific research to the extent of 7,000 francs during the past year; of this sum 5,000 francs was accorded to Dr. Janssen as a contribution to the expenses of his recent voyages, and 2,000 francs to M. Chapelas-Coulvier-Gravier, to enable him to continue his researches on shooting stars. M. Cornu referred to the great importance of the Puy-de-Dôme Observatory, of which we have frequently spoken, and the formal opening of which had been deferred in anticipation of the present meeting. He concluded by eloquently urging the Association to continue to be animated by the spirit in which it was begun in the days of France's sore distress, to keep free from all party spirit, and to seek to be spoken of only and always as the friend of science and of the country.

The treasurer, M. Masson, gave an account of the state of the funds, which is very satisfactory. The Association is prosperous, numbering 2,200 members, including 200 ladies. The receipts for the Nantes meeting were greater by 400*l.* than the expenses. The funds of the Association amount this year to 7,000*l.*

In the evening a reception was held at the Hôtel de Ville by the mayor, which was perfectly successful.

On Saturday, at two o'clock, the several sections met to appoint their officers. Among the strangers present were Lord Houghton, Dr. Gladstone, the Rev. S. J. Perry, Mr. Eaton, Prof. Boyd Dawkins, and several other Englishmen.

M. de Mortillet, the sub-director of St. Germains Museum, has been nominated the president of the section of Anthropology. He delivered an address on the origin of superstitions. He showed that the present superstitions must be mostly connected with old Celtic populations.—M. Tchebycheff, the Russian geometer, has been appointed president of the Section of Mathematics. M. Tchebycheff exhibited a machine for performing addition and subtraction with extraordinary rapidity.—M. de Lucas presented the designs for the construction of a machine intended for the fabrication of prime numbers.

The places of interest in and around Clermont are open to the inspection of the members of the Congress, as is the case at meetings of the British Association, consequently the Sunday excursions have been numerous and highly attractive. The prehistoric archæologists visited the palæolithic habitations recently discovered at Issoire. A pleasure trip was made to Vichy, and a large number of members went to Thiers. The excursionists to Vichy were welcomed by the Mayor, Dr. Cornil. Among the toasts proposed was that of Lord Houghton, as a Vice-President of the British Association, who made a suitable reply.

In the city of Clermont are located the celebrated incrusting fountains, which convert into stone, wood and even animals. A rich collection of specimens has been opened for inspection, and will be visited officially by the Section of Geology this week.

An incident has occurred which created a little sensation. The members were assembled in a general meeting to hear a lecture on the mountains of Auvergne, when an intimation was received that the lecturer had been taken ill. M. Claude Bernard, the well-known physiologist who was present, was therefore invited to deliver an address. He lectured on the sensibility of plants, a subject which he has been investigating.

SCIENCE IN GERMANY

(*From a German Correspondent*)

M. W. SIEMENS has recently endeavoured to determine the velocity of propagation of electricity in suspended wires. His method of observation consists in the employment of two insulated Leyden jars (or two charge tables), the outer coats of which are metallically connected together. The inner coating of one jar is directly connected by a short wire with a metallic point; that of the other is also connected with this point, but by a long circuit line. Opposite the point stands a rotating metallic cylinder connected with earth. When the outer coats of the jars are connected with earth, the electricity of the inner coating of both jars at that moment becomes free, and is discharged through the point and the rotating cylinder to earth. If the rotation is sufficiently rapid, and the line long enough, there are produced on the smoked cylinder two marks with an interval between them, which is the measure of the time the electricity took to pass through the wire line from the jar to the point. This arrangement was also modified by placing two points, instead of one, opposite the metallic cylinder; the one being connected directly with one jar, the other by the line with the other jar. A discharge of the jars was first obtained while the cylinder was at rest, and then the discharge was made with the rotating cylinder.

M. Siemens thought at first that the velocity of propagation of electricity must be proportional to the specific conductivity of the material. In discharge of a jar through a caoutchouc tube filled with water, or through a wet thread, no time difference could be perceived between the mark of the direct discharge, and that of the first partial discharge through the liquid. It was the same with discharge of the jar through a strong caoutchouc tube, 100 feet long, and 20 mm. clear diameter, which was filled with zinc vitriol solution. Now, since a difference of five millionths of a second might be distinctly perceived, it is thus proved that the velocity of electricity in liquids must be *over* 800 geographical miles per second. As the conductivity of copper is at least 200 million times greater than that of the zinc vitriol solution, the velocity of electricity in copper must be at least 160,000 geographical miles if the specific conductivity were synonymous with the velocity of electricity.

From experiments with longer telegraph lines it appeared that the propagation of electricity in conductors occurs with a determinate velocity independent of the length of the conductor; this is, in iron wires, between 30,000 and 35,000 geographical miles per second. (The length of the line was in one case 25·36 kilometres, in others 23·37 and 7·35 kilometres.)

M. Siemens proposes to make similar experiments with a copper circuit in order to decide, by direct experiment, the question whether the velocity of electricity depends on the nature of the metallic conductor or not. From the experiments made with the caoutchouc tube filled with zinc vitriol solution, he considers the latter the more probable. We may further remark that Prof. Kirchhoff (in establishing Weber's fundamental law for the motion of electricity) already previously obtained the number, 21,000 miles, for the velocity of electricity in conductors, and at the same time came to the result, that this velocity must be equally great in all conductors. Siemens's measurements come much nearer to Kirchhoff's values than to that obtained by Wheatstone, viz., 61,900 geographical miles. S. W.

GERMAN EXPEDITION TO SIBERIA

AS a sketch of the present state of Central and Northern Asia, it may perhaps not be uninteresting to our readers to have laid before them the following extract from a letter written by Dr. Finsch, who, together with Dr. Brehm and Count Waldburg-Zeil, is at present engaged in the scientific exploration of Southern Siberia, under the auspices of the German Arctic Society. The letter dates from Lepsa, near the Balkash-lake, May 13.

"We started for Lepsa on May 3, and camped the first night in 'yurts'—tents—ready for us at the foot of the Arkat Mountains. The yurt destined for our own use was splendidly decorated [for, thanks to the orders of the Czar, the travellers found at each station everything requisite for their comfort and the prosecution of their journey ready for them; in addition they were always accompanied by a picket of Cossacks, who had to provide horses for them, and to see them safely from station to station.]

"Many Kirghiz chiefs, dressed in their picturesque attire, were awaiting our arrival, and we found a repast of pillaf, lamb, and kumis, ready for us. The Arkat Mountains are a mass of

bare, grotesque-looking rocks of granite, about 1,000 feet high. It is a solemn sight to see them gradually rise before your eyes out of the vast treeless steppe. Numbers of Argali were seen running on the mountains, and we proposed for the next day an Argali-hunt. The hunting party offered a strange picture on the next morning; there were fifty Kirghiz chiefs on horseback, many of them holding golden eagles on their hands. These birds are trained here to catch the wolf and the fox, and they acquit themselves excellently of their task, except in spring, when, their minds being taken up by love-thoughts, they are unfit for work. It is wonderful to see how the Argali dash along the rocks, and the young ones as quick, or perhaps still quicker, than the others. Several Argali and Argali kids were killed; we saw also a wolf, but failed to kill him. On the next day was a race of the Kirghiz boys; they rode 20 versts in 54 minutes. After that there was a wrestling match. The Kirghiz formed two divisions, each having its champion, who, dressed in shirt and drawers, was ready for the match. They stood with their shoulders together, and tried to throw each other down by seizing each other's girdle. The combatants were fine, muscular fellows. They showed also some equestrian feats, such as riding at full gallop standing. At about seven o'clock we continued our journey, and arrived the next morning in Sergiopol, formerly called Ajacus, a small town of about 1,000 inhabitants. The road to Sergiopol leads altogether through the steppe, which from time to time is covered with small mountain-ranges; on the last station before Sergiopol we saw for the first time the snowy tops of the Targabatai.

"Interspersed everywhere through the steppe are the yurts and peculiar tombs of the Kirghiz, whose herds wandering over the steppe help to animate it. The town lies in a treeless plain; before reaching it we were received by a picket of Cossacks in their gala-uniform, who conducted us to our quarters. Here we were welcomed by the district chief, Col. Friedrichs, who for ten days had awaited us in Sergiopol. Here we obtained some fine specimens of fishes from the Balkhash-lake, and we continued our road accompanied by Mr. Paul, a German telegraph official, and the commander of the town, Major Politzky. The line of Cossacks is here at an end. From time to time there is a miserable mud hut called "picket," where Cossacks ought to be. Horses are generally to be had there, vehicles but seldom. Our road led us always through the steppe, which began to show a white salty incrustation, and which everywhere is bordered in the most picturesque manner by the Tarbagatai. All along the road we were accompanied by Cossacks and chiefs of the Kirghiz. We took our first station on the banks of the Karakol, where we had a splendid view of the Tarbagatai and the more distant snowy heights of the Ala Tau, in the south. Here we found new specimens of the fauna of the steppe; the sandpiper, the eastern turtledove (*Turtur gelastes*), the white-throated lark of the Alps, the grey-headed wagtail During the night we heard a strange cry, and found it to proceed from a frog, of which we obtained a specimen. Beetles were very scarce in the steppe, nor did we see any butterflies; perhaps it was still too cold. Our tea gets worse and worse, as now the water contains more and more salt; our principal beverage is, therefore, kumis, which, after all, is not so bad; it tastes a little sour, like buttermilk, and has a strange smell and after-taste. The major and Mr. Paul remained behind in Karakol, and so did our baggage-cart, therefore our baggage had now to be carried by three camels. Behind Karakol are the first Kirghiz who cultivate the soil; they grow wheat in vast fields, irrigating them by damming the river, and turning over the fertile soil with a miserable plough that penetrates only to a depth of a few inches. The labourers were surrounded by numbers of *Larus ridibundus*. The first 12-15 versts we had to ride, because, from this forward, only the wild horses of the steppe were to be had, which up to this time had never seen a vehicle. It was most interesting to see the wild animals harnessed to the tarantassa; five fellows had at times enough to do to hold a single horse, and then off we went with shouts and blows, away like the wild huntsman in the story-book. As long as the vehicle held together everything went on well, but very often traces and reins broke at the first start. The steppe is covered with rhubarb, hemlock, and spiræa just beginning to flower. Where the alkali earth begins the ground was bare, and the plants which grew there had a grey, sombre colour. We saw sometimes the great and little bustard, also many kites, and here and there a golden eagle—kulans (wild horses) and antelopes (saigas) were not seen. On May 8 we entered upon the genuine salt steppe, and our horses sank up to their fetlocks in soil covered with a crust of white salt. The dust was awful; our way led through immense beds of reeds, and we found ourselves most probably in the dry bed of the lake Ala Kul. At night we reached the banks of the actual lake from the west side. At first there is nothing but a dense mass of reeds, only here and there is a narrow strait visible. Many geese, ducks, and swans were heard; we obtained here a specimen of the land tortoise. The next day we continued our road on the south side. It was very hot, and splendid mirages were dancing in the air; our way led continually through the salt steppe; the lake was mostly covered by reeds; only at two places was it to be seen. In the afternoon we reached a camp of yurts situated at the foot of a hill on the south side of the lake. The scenery before us was splendid; in the foreground the vast surface of the lake of a greyish blue bordered in the background by the Tarbagatai, and behind it rose the snowy summits of the Ala Tau. Numbers of birds are at the lake, innumerable grey geese with their young ones, ducks, swans, grey cranes, gulls, amongst these the beautiful grey fisher-gull (*Larus ichthyætus*). The waterfowl were unfortunately very shy and scarcely to be approached. Near the lake on the steppe we found for the first time rose-starlings (*Rosenstaare*) and black-headed wagtails, amongst these some with white eye stripes, and a peculiar lark. We did not obtain any specimen of the reed-pipers, because shooting was impossible among the dense reeds. I got all the Kirghiz to help me to collect, and so we obtained beetles and two varieties of lizard, one most interesting, a kind of gecko, with pink and blue spots. It was very hot, 79° F. in the shade, and many gnats appeared. After having made a small raft out of the trunks of trees we went fishing and caught many fishes, but only three to four varieties, all unknown to me, most interesting, and by no means belonging to the European kinds, with the exception of a sort of Cobitis. There was a peculiar fish about 2 feet long called Marinka, and said to be poisonous, but we tasted it and found it quite palatable. For two days we remained near the lake, living in a yurt belonging to the Sultan Abin Dair, who traces his pedigree from Jenghis Khan, and belongs to the "nobility of the white bone"; he possesses 2,000 yurts in his dominions. We collected many plants and some snails near the Ala Kul, and took samples of the soil, salt and water. We continued our road, passing through the steppe, onward to the Ala Tau, at the foot of which we took a night's rest in a yurt, whence we saw many Kirghisian tombs of unburnt bricks. The next day we were obliged to ride, because one of the horses objected altogether to be harnessed, and the others ran away with the vehicle. After some time, however, they became quieter, and we could again get into the vehicle. Meanwhile, the temperature had changed; it was very chilly; we were cold in spite of the furs, and happy to reach another yurt camp at about midnight. The road was scarcely perceptible; the Cossacks had to hold the carriage with ropes, and we heard continually the cry of "derschdi," *i.e.* hold fast. Dr. Brehm had an upset. On the next morning our road led through the green steppe interspersed with many "Auls" of the Kirghiz, whose herds, consisting chiefly of goats and fat-tailed sheep, were pasturing here and there. In the south the steppe was bordered by green hillocks, with masses of red outcropping rocks; in the west by bare sand hills, in the north and east by a higher range of mountains, covered with fresh-fallen snow, behind which rose the high summits of the Ala Tau. And on we went more into the mountains. We passed over the river Dschindschilla, where red bole is to be found, and then on without interruption through ravines and over mountains, on through the green but treeless landscape. We collected magnificent wild, red peonies, blue campanulas, and other plants; and here we saw for the first time the bee-eater. At length we saw Lepsa before us in the plain, surrounded by green but bare mountains; except in the south where they were covered with trees, behind which rose the picturesque peaks and cones of the Ala Tau, half their height covered with snow. Lepsa has nearly 3,000 inhabitants, consisting mostly of Cossacks and Tartars. Some Kirghiz live near. Broad streets planted with birch trees run through the town and give it a pleasant appearance. The houses are nearly all small and built of wood. Besides the Cossacks there is a regular battery stationed there. The town was founded since the conquest of Turkestan, and is growing rapidly. The Cossacks cultivate the ground and keep bees; the honey is very fine, and cuts like lard. We live very comfortably in the house of a rich Cossack, who possesses 2,000 hives, and only regret that we have to leave so soon."

NOTES

MR. J. W. JUDD has been appointed Professor of Geology in the Royal School of Mines in succession to Prof. Ramsay, who resigned some time since. Mr. Judd has been a frequent contributor to our pages and has already taken a very high place in he field of original geological research. His appointment as Prof. Ramsay's successor must give universal satisfaction.

PROF. RAMSAY has been called away to Gibraltar to report on the water-supply there; his place as a lecturer at the British Association will be taken by Prof. Tait.

MR. PORTER POINIER, a most promising young physicist, died in New York on June 11, aged 23 years. In the Polytechnic Institutes of Troy and Hoboken, he had thus early developed a very remarkable genius in the department of applied science. His studies had led him, with great success, into original investigations of heat as a force in nature, and his thorough and accurate and independent researches in this direction had attracted the favourable notice of the faculties under whom he studied. He attained to such important results as were found worthy of public notice, and he was engaged in the preparation and publication of an original work on the Dynamics of Heat, with the approval of his professors. His enthusiasm drank up his spirits, and utterly exhausted his physical force. Before he was aware, he was in the advanced stages of an incurable disease, and while labouring to put his work through the press at Cambridge, he was pronounced beyond recovery. His very rare attainments and his extraordinary promise in the field of research, had been brought to the notice of the Johns Hopkins University at Baltimore, and the day after his death, only too late for his noble ambition, came the certificate from the heads of the university appointing him to a fellowship in that institution. As a lecturer in the department of his special and successful study he had become familiar with the best French and German works in modern science, and his accuracy, and perseverance, and thirst for knowledge, gave him promise of a very eminent future. We believe that there is good ground for hoping that Mr. Poinier's work on thermodynamics may be found to have been sufficiently advanced before his death to be still a valuable contribution to science. A very touching letter from a relative states that "he begged his physicians to keep him alive just to finish his book, and then he would be willing to go."

THE British and the Cambrian Archæological Associations held their Annual Congresses last week, the former in Cornwall and the latter in South Wales. The members of the former were occupied mainly with visits to the various architectural remains in which Cornwall is so rich, and especially to the localities which are identified with the Arthurian legends. Mr. W. C. Borlase exhibited on Sunday afternoon to a large number of the members, his valuable collection of objects of prehistoric and antiquarian interest. On Monday a visit was paid to St. Just, in the neighbourhood of Land's End, and on the road thither, a number of Cromlechs and an old hill-castle were visited. The meeting, during which a considerable number of antiquarian papers were read, was brought to a close on Tuesday. In the latter, which was opened at Abergavenny, the President was Dr. E. A. Freeman, who gave a valuable address on the importance of Welsh history, referring to the fact that there is no really good history of Wales, and urging upon the Association the advisability of a competent member at once undertaking to supply the want. The members visited several places in the neighbourhood of architectural interest. Both Congresses seem to have been successful.

THERE seems to be some doubt about the Social Science Congress meeting this year in Liverpool, on account of the difficulty in finding a building large enough to contain the many objects which it is intended to exhibit.

THE Statistical Congress opens at Buda-Pesth on Sept. 1. A Congress of Archæology and Anthropology will also be held at Buda-Pesth in the beginning of September. A proposition will be discussed for making the French language the only one to be used at such international meetings.

THE 25th meeting of the American Association for the Advancement of Science commenced at Buffalo, N.Y., yesterday.

THE University of Upsal, Sweden, will, says the *Revue Scientifique*, celebrate next year, in September, the 400th anniversary of its foundation.

THE Madrid *Official Gazette* states that the Spanish Government has appointed a commission to inquire into the situation and the resources of the Philippine Islands. A botanist will accompany the expedition for the purpose of reporting on the nature of the flora of the interior, the extent of the forests, &c. The Commission will explore carefully the whole group, in order to prepare a map on a large scale. The mountain-chains will be the object of special investigation; the height of all the salient points will be determined with the greatest precision. The officers of the expedition will take notes and make observations for the purpose of preparing a complete monograph of all the islands explored.

THE number of visitors to the Loan Collection of Scientific Apparatus during the week ending August 19 was as follows:—Monday, 2,710; Tuesday, 2,180; Wednesday, 280; Thursday, 270; Friday, 228; Saturday, 3,250; total, 8,918.

MR. T. A. DILLON, writing to Tuesday's *Times* in reference to the proposal to blow up the *Vanguard*, shows that such a course would be quite wanton. He states that he has proved by varied and critical experiments, that by covering the ship tightly with a sheet of canvas a diving-bell would be formed, from which air-pumps could easily expel the water, and the ship would recover her buoyancy and instantly rise and float. Judging from the experiment described by Mr. Dillon, the attempt ought to be made, and that, too, with the greatest hope of success.

A GENERAL Meeting of the Mineralogical Society of Great Britain and Ireland will be held at Glasgow on the afternoon of Wednesday, Sept. 6, after the meeting of the General Committee of the British Association. The exact time and place will be posted up in the British Association Reception Rooms. The chair will be taken by Prof. M. Forster Heddle, M.D., F.R.G.S. All papers intended to be read should be forwarded to Mr. J. H. Collins, at 57, Lemon Street, Truro, Cornwall, not later than Saturday, Sept. 2.

FROM the "Report of the Manchester and Salford Sanitary Association for 1875," we observe that this influential book continues in full activity the good work it has long done in promoting public interests. The pollution of rivers, hospital accommodation, and the control of noxious vapours, are some of the subjects affecting the public health which have occupied the Association during the year. Three of the winter lectures, viz., those on the causes reducing the effects of sanitary reform, on the preservation of health, and on the seeds of disease, have been published at a penny each, and tracts on such subjects as typhoid and scarlet fevers, vaccination, personal cleanliness, clothing, houses, and the feeding, clothing, and nursing of children, have been distributed to a large extent. But what distinguishes this from all other similar societies are the returns of disease in public practice which are published weekly, no other statistics of the kind being published in the kingdom. We earnestly hope that the Association will soon be in a position to discuss the invaluable material they have now accumulated under this head, and publish the results in the form of weekly averages for the different diseases, since the important question of the relation of

weather to health cannot be satisfactorily handled, unless not only the number of deaths, but also the number of attacks, be known.

In the *Hansa* for July 23, at p. 143, appears the first of what promises to be an interesting series of articles by Captain Niejahr on the relation between the formation of clouds and the direction of the wind on the coasts of Northern China and and Japan, between 28° and 42°, lat. N., and 121° and 142° long. E.—a region peculiarly suitable for this practical inquiry, inasmuch as it lies between the continent of Asia and the expanse of the Pacific, and its southern portion is besides within the region of the N.E. trade. Attention is more particularly drawn in this article to two disiinct kinds of cumulus which suddenly appear in the form of a massive bank of clouds in the western horizon, and are rapidly dissolved as they drift eastward, disappearing before they sink to the eastern horizon, often even before they reach the zenith. These two kinds of cumulus, distinguished as wind-cloud and simple cumulus, differ in their outlines, consistency, and height, in the direction of their motion and the mode of their formation, and there can be no doubt that thorough investigation of them would result in no inconsiderable advantage to navigation. We look forward with much interest for the continuation of this discussion in future numbers of the *Hansa*.

The Municipal Council of Paris has established a certificate for the pupils of municipal schools; the examinations are proceeding now at Luxembourg. The number of candidates is about 4,000.

In consequence of the appointment of Mr. L. C. Miall to the Professorship of Biology in the Yorkshire College of Science, the office of Assistant-Secretary to the Leeds Philosophical and Literary Society is now vacant. Mr. R. Reynolds, the Honorary Secretary of the Society, will, we believe, give every information to candidates for the post. Prof. Miall will still continue to act as general curator of the museum.

In connection with the general introduction of the now celebrated Liberian coffee plants into most of the coffee-producing countries, as noticed by Dr. Hooker in his recently issued report on Kew Gardens, we may draw attention to what our consul says on the decrease of the production of coffee in Cayenne. The kind there cultivated is the Mocha, which at one time was an important staple of the colony, the country being especially adapted for its cultivation. This valuable product of Cayenne, although temporarily abandoned, is not lost to the world; the trees continue to thrive in a wild state, and may be reclaimed hereafter. There are thousands of coffee trees interspersed in the forests of the inhabitable part of the colony which have been abandoned for years. They attain a height of about fifteen or sixteen feet, with a circumference, a few feet from the ground, of thirty inches; they are rich in foliage, but do not bloom. The coffee tree also appears to be safe from the ravages of insects, whereas many other trees suffer vitally from this evil.

The *Ergebnisse der Beobachtungsstationen an den deutschen Küsten*, 1875, published monthly, have been received. In their researches into the physical peculiarities and fisheries of the North and Baltic Seas, the Ministerial Commission at Kiel continue to carry out with vigour and ability the comprehensive system of observation established by them a few years ago, under which the physical data necessary for the solution of many questions affecting the fisheries of these seas are being gradually accumulated These include physical observations at nineteen stations on the daily height of the water of the seas, their temperature, specific gravity, and currents, and the amount of cloud and direction and force of the wind; very full meteorological observations at four stations; and the details of the daily fishings in each of the seven districts of the coasts. It might be suggested whether observations of daily maxima and minima of the temperature of the sea by thermometers continuously immersed, as suggested by Mr. Stevenson, and carried out by the Scottish Meteorological Society in similar inquiries, might not, from their great practical value, be added to their physical observations by the Commission at Kiel.

An account of the geology, physical geography, and botany of the West Riding of Yorkshire, is now in course of preparation, and will shortly be published by subscription. The geological portion of the work will be undertaken by Mr. J. W. Davis, F.G.S.; Mr. F. Arnold Lees, F.L.S., will be responsible for the botany, while the division of physical geography will be a joint production of the two authors. In this last section, with the description of each locality, the flora of each area will be given. We believe Mr. J. W. Davis, of Greetland, Halifax, will furnish particulars and receive subscriptions.

The Mayor of Marseilles and the Prefect of Bouches du Rhone have signed a contract obliging the city to pay a yearly subvention of 15,000 francs to the Observatory, and to continue *in perpetuo* the free grant of lands and buildings in the present site occupied by it. M. Waddington will ask the Budget Commission for an enlarged credit.

We are glad to notice the advent of a new Norwegian journal of science published at Christiania, and entitled *Archiv for Mathematik og Naturvidenskab*, the editor being M. Albert Cammermeyer. The following are some of the articles contained in the first two numbers:—"On the Ancient Norwegian Coasts," by M. Sexe; "On the Fjords and Glaciers of Northern Greenland," by Amund Helland, who visited this country during the months of June, July, and August, 1875; a review by Worm Müller, of Malassez's "La Numération des Globules Rouges du Sang." Besides these there are other papers on Geology and Meteorology. We wish every success to this new periodical.

The proposal to submerge a portion of North Africa by means of a canal from the Gulf of Gabes, letting the water of the Mediterranean westwards over the lake region of Djerid, seems from the facts detailed by MM. Roudaire and Dupuis to be not only a practicable, but also likely to turn out a remunerative undertaking. Owing to the comparatively small area it is proposed to submerge, the meteorological changes which the submersion would occasion can only be slight, strictly local, and altogether beneficial in their general tendency—differing absolutely in all these respects from the meteorological changes which would result from the submersion of the western portion of the Sahara, proposed some time ago. From this latter project it would follow, owing to the great extent of the water surface which would thus overspread the Western Sahara, and its proximity to the Atlantic, that the present disposition of the lines of atmospheric pressure would be seriously altered, a result necessarily attended with changes in the prevailing winds and currents of the North Atlantic, seriously affecting international interests in a manner which our present knowledge does not enable us in any way accurately to predict. But such an objection does not apply, as already stated, to the project of submerging the region of Djerid.

The law for the International French Exhibition for 1878 has been voted by the Senate. M. Krantz, the director, an engineer, has established his offices at the Palais de l'Industrie, and sixteen pupils of the School of Beaux Arts are executing building plans under his direction. The work of construction in the Champ de Mars is expected to begin almost immediately.

On July 26 the shock of an earthquake was felt at Grenada, the direction of the oscillations being north to south. As the

duration was only a few seconds no real damage has been recorded.

An interesting series of papers is commenced in the August part of the *Geographical Magazine*, giving Sketches of Life in Greenland, by a lady who was born and passed several years of her life in the country. The papers are likely to show life in Greenland in somewhat new aspects. In the same number is a long and valuable letter from Dr. Beccari on New Guinea, dealing chiefly with its ethnology; he holds firmly to the opinion that the Papuans are a mixed people. Mr. H. P. Malet contributes a paper on the Sea-Level, and Mr. Ravenstein continues his paper on the Census of the British Isles.

In the last issued number (May) of the *Bulletin* of the French Geographical Society, is a long and valuable Report on the Progress of the Geographical Sciences during the year 1875, by M. Ch. Maunoir. In the same number is the conclusion of M. De Sainte-Maire's Itinerary in Herzegovina, and the address of the President, Baron De La Roncière Le Noury, at the last general meeting of the society.

The "concours general," or competition between the pupils of the several colleges of Paris, is an old institution established by the University of Paris about thirty years before the French revolution. In 1730 a Parisian *bourgeois*, called Legendre, bequeathed to the University a large sum of money under that condition. The University was put in possession only after a long law-suit instituted by the heirs, who urged insanity, but at last were defeated. A number of celebrated *littérateurs* have been successful candidates. This year the *prix d'honneur* was taken by young Remach, who for the first time since the "concours general" was established, took all the other prizes of his class. The success of the "concours general" for the colleges of Paris was so large that M. Duruy established in the last years of the Empire a competition for all provincial colleges, Paris and Versailles excepted. This year the most successful college was Grenoble, which took eight nominations. Lyons took only seven.

Some interesting particulars of the great rains which occurred in the north-east of Switzerland in the middle of June last are communicated by M. F. Zurcher to the *Bulletin Hebdomadaire* of the Scientific Association of France. From 8 P.M. of the 13th to the morning of the 14th the enormous quantity of 12·4 inches of rain fell at Zurich—a quantity greater than any monthly fall since the observations began in the end of 1863, the largest monthly rainfall having been 11·3 inches during March, 1876. Owing to so unprecedentedly large a rainfall and the melting of the snows which occurred at the same time, Lake Constance rose nearly 10 feet above its usual level. It may also be noted that heavy rains have prevailed since the beginning of February, so much so that on the morning of June 14, the amount collected, reckoned from the beginning of the year, was 45·67 inches, being nearly 2 inches above the annual average rainfall of Zurich. Whence came the aqueous vapour which was discharged from the clouds in such deluges of rain on the night of June 13-14?

In the same number of the *Bulletin Hebdomadaire* it is stated that Dr. Grzygmala, of Podolia, in East Russia, where hydrophobia is very prevalent, has successively treated, without a single failure, more than a hundred cases of hydrophobia with the leaves of *Xanthium spinosum*. It is necessary that the remedy be applied shortly after the person has been bitten and before the symptoms of hydrophobia become manifest—the treatment consisting of 9½ grains of the leaves of *Xanthium* in the form of a powder, thrice a day for three weeks. For animals the treatment is the same except that the dose is larger.

The additions to the Zoological Society's Gardens during the past week include a Spotted Eagle (*Aquila nævia*), European, presented by Mr. W. Prodham; two Common Barn Owls (*Strix flammea*), European, presented by Miss M. A. Hicks; a Yellow-bellied Liothrix (*Liothrix luteus*) from India, presented by Mr. W. Prehn; a Common Cuckoo (*Cuculus canorus*), European, presented by Mr. J. Paddy; an Egyptian Vulture (*Neophron percnopterus*) from North Africa, deposited; two White-crested Laughing Thrushes (*Garrulax leucolophus*) from the Himalayas, a Sun Bittern (*Eurypyga helias*) from South America; a Hawk's-billed Turtle (*Chelone imbricata*) from the West Indies, purchased.

SCIENTIFIC SERIALS

American Journal of Science and Arts, July.—Prof. Loomis here gives some interesting results obtained from observations of the United States Signal Service. Whenever an area of low barometer is formed in the United States, there seems to be always an area of high barometer about 1,200 miles to the south-east. The same thing was found to hold for the Atlantic Ocean and Europe, the average distance between the areas being here 1,700 miles, and the direction rather more southerly. Areas of high pressure are probably formed from air that is expelled from those of low. Low barometer is generally associated with high temperature, so we might conclude that a temperature above the mean in Iceland would be accompanied by one below the mean in Central Europe; this was verified. An unusually high barometer in Central North America may be the result of storms 1,500 or 2,000 miles to the north-west. Prof. Loomis found the average forms of the isobars about an area of maximum pressure, an oval with major axis nearly double the minor. The forms about minima were nearly the same; as were also the directions of the major axes in both cases (N.E.). The rainfall is least when the pressure at the centre of a storm is increasing (or the storm diminishing in intensity), greatest in the opposite case. The stationariness for several days of storms near Nova Scotia or Newfoundland, seems due to unusual rainfall there. Prof. Loomis lastly furnishes data as to the course and velocity of storms in tropical regions.—Prof. Farlow has studied a disease which caused much loss of olive and orange crops in California last summer. He says that though first attracting the eye by the presence of a black fungus, the disease is not caused by it, but rather by the attack of some insect, which deposits some gummy substance on the leaves and bark, or so wounds the tree as to cause some sticky exudation on which the fungus especially thrives. The fungus greatly aggravates the trouble, but in seeking a remedy, it is necessary to look further back.—Mr. Gilbert gives a description of the Colorado Plateau Province as a field for geological study; it offers valuable matter in an advantageous manner.—Drs. Blake and Genth describe a vanadium mica found on the western slope of the Sierra Nevada, and to which the name of Roscoelite is given, in honour of Prof. Roscoe. It contains quite a large per-centage of vanadium (20·16), which is present as V_6O_{11}. This mica is found in the hanging wall of a small quartz vein, the country rock being porphyry; fine scales of gold occur between the crystals.—We may further mention a series of notices of recent American earthquakes (1874-76), by Prof. Rockwood.—Mr. Grinnell describes, in the Appendix, a Crinoid from the Cretaceous formation of the West.

Poggendorff's Annalen der Physik und Chemie, No. 5, 1876.—In this number we have the first portions of two valuable papers on electrical subjects—one by M. Root on dielectric polarisation, the other by M. Wiedemann, on the laws of passage of electricity through gases. We shall return to these.—M. Edlund passes under review some researches on what he had termed *galvanic expansion;* confirming and extending the observations of Streintz in reply to objections urged by Wiedemann against the results from which M. Edlund inferred that there was such expansion (distinguishable from that by heat). From the fact that it disappears pretty much according to the same laws as heat, the author and M. Streintz supposed that it was caused by molecular oscillations which are gradually communicated to the surrounding medium; and anything furthering this communication must so diminish said expansion. Now, M. Exner lately experimented by keeping the wire through which the current was sent, in cold water; and the result was an entire disappearance of galvanic expansion, as might have been expected, but the phenomenon was not thereby proved (as M. Exner thought) to have no existence.—In

experimenting as to the influence of current strength, temperature and concentration of solution, on the transference of ions, M. Kirmis met with a peculiar regular arrangement of silver crystals in the platina dish of a silver voltameter. The result is best obtained with a considerable electromotive force. The intensity should not exceed a certain limit (not more than 0·28 mgr. of silver being separated out per square ctm. and minute). The concentration of the solution should be between 5 and 10 per cent., and a positive electrode with sharp points should be used. The deposited strips appear as accumulations of moss-like dendrites, which, under the microscope, are found to be made up of cubes and octahedra.—In works which describe the process that occurs in sounding an open or closed pipe, it is usually represented that the air current from the slit at the bottom, breaking against the upper lip, imparts shocks to the air column of the pipe, and these are the cause of the air-column being thrown into vibrations. M. Sonreck, an organ-maker of Cologne, here questions this hypothesis, and supposes instead a pendulum-like to and fro motion of the blast-current, which has the widest amplitude at the edge of the upper lip, is dependent on the elasticity of the air-column of the pipe and the pressure of the outer air, and so is subject to the laws of vibration of the air-column. He explains the process in some detail, and some interesting forms of experiment are described. For complete determination of any colour it is necessary to know three things, viz., the colour-tone, purity, and brightness. The first is found by ascertaining that spectral colour by whose mixture with white the colour in question is had. M. von Bezold describes two methods of doing so simply and without trouble. They are closely related to a plan suggested by Vierordt for producing mixtures of pigment and spectral colours.—M. Gieseler describes a simple apparatus for measuring small intervals of time by a determination of the time of fall of a freely-falling body.—We further note papers on the specific heat of cerium, lanthanum, and didymium, by M. Hillebrand; and on experiments on the electro-motive forces induced in unclosed circuits through motion, by M. Helmholtz.

THE current number of the *Ibis* commences with a paper by Prof. Newton and Mr. Edward Newton on the Psittaci of the Mascarene Islands, in which the Seychellian *Palæornis wardi* is figured, and the species peculiar to each of the islands are described, four of the eight being extinct, one barely surviving, and the remainder diminishing in number.—Mr. H. Seebohm and Mr. J. A. Harvie Brown continue their notes on the birds of the Lower Petchora, figuring the eggs of *Tringa minuta* from Dvoinik.—Mr. D. G. Elliot in his notes on the Trochilidæ discusses the genera *Cyanomyia* and *Heliotrypha*, describing seven species of the former, one, *C. microrhyncha*, being new, and three of the latter, *H. squamigularis*, of Gould, being shown to be *H. barrali*, of Mulsant and Verreaux.—Mr. H. E. Dresser continues his notes on Severtzoff's "Fauna of Turkestan," specially referring to *Ciconia mycteriarhyncha*, a species with the bill shaped like that of *C. boyciana*, but red.—Mr. R. Swinhoe describes a collection of birds from Hakodadi, in Northern Japan, sent by Mr. T. W. Blakiston. Two new species are described and figured, *Arundinax blakistoni* and *Schœniclus pyrrhulinus*.—Lord Walden makes notes on the late Colonel Tickell's manuscript work entitled "Illustrations of Indian Ornithology." The work was presented by the author in 1874 to the Zoological Society. It is beautifully illustrated and fully annotated, forming seven small folio volumes. Figures are given of *Picus atratus*, *Zosterops siamensis*, and *Dicæum trigonostigma*, together with a brief account of the contents of each volume.—Mr. P. L. Sclater records further ornithological news from New Guinea, describing results arrived at by Beccari, Bruijn, and D'Albertis. The collections of the two first-named contain 4,600 specimens, referable to 350 species, of which 58 are said to be new to science.—Mr. J. H. Gurney continues his criticism of Mr. Sharpe's "Catalogue of the Accipitres in the British Museum."—Lord Walden describes and figures a new species of *Trichostoma* from Celebes, *T. finschi*, and finally Mr. Salvin describes a new *Odontophorus*, *O. cinctus*.

Geological Magazine, Nos. 141, 142, 143, 144, 145.—The articles that are running through several numbers are:—Sketch of the geology of Ice and Bell Sounds, Spitzbergen, by Prof. A. E. Nordenskjöld, with woodcuts.—The probable conditions of deposit of the Palæozoic rocks in the northern hemisphere, by Henry Hicks, with a folding plate comparing Europe with North America—Cretaceous Gasteropoda, by J. Starkie Gardner.—There are several papers on glaciers and ice-action: among them are Mechanics of Glaciers, David Burns.—Ice-work in Newfoundland, John Milne (of the Mining School, Japan).—Glacial events in England and Wales, D. Mackintosh.—The erosion of lake-basins by glaciers, Osmond Fisher.—Notes on glaciers, T. G. Bonney.—Sub-aërial denudation *versus* glacial erosion, W. Gunn.—There are also many letters on the subject of the origin of lake-basins from Prof. Ramsay, James Geikie, Prof. Hull, Prof. Green, J. W. Judd, T. V. Holmes, Hugh Miller.—The other papers are: On the Carrara marbles, by G. A. Lebour, showing why they are now regarded as of Carboniferous age instead of Jurassic, as recently they have been.—The transport of volcanic dust, by Prof. Nordenskjöld. This is a record of the passage of volcanic dust from Iceland to the east coast of Sweden, a greater distance than has ever been known before.—A paper on the vertical range of graptolites in Sweden, by G. Linnarsson, is accompanied by one on the correlation of the graptolitic deposits of Sweden with those of Britain, by Prof. H. A. Nicholson.—On the exhumation and development of *Omosaurus armatus*, Owen, by W. Davies, of the British Museum. This is a popular description of how the remains were removed from the Kimmeridge clay of Swindon to the British Museum.—On the volcanic outbursts which preceded the formation of the Alpine system, by J. W. Judd.—In connection with Mr. Hick's papers on Palæozoic rocks is one by Prof. Linnarsson, criticising some of his conclusions.—There are also some minor papers and a number of miscellaneous articles.

SOCIETIES AND ACADEMIES

VIENNA

Imperial Academy of Sciences, Feb. 3.—Contributions to a knowledge of interstitial inflammation of the liver, by M. Müller.—On the ending of nerves in the epidermis of mammals, by M. Mojsisovics. He examined (after Eimer) the snout of the mole, and of some foreign related species; and he comes to a different conclusion regarding the "Eimer organs." M. Riegler exhibited an osteophyte, weighing 1,120 gr., that had been found in the skull of an ox. The animal had seemed quite fresh and healthy.

Feb. 10.—On the colours of thin crystal plates, by M. Ditscheiner. These arise through interference of the internally reflected light rays, and are seen in crystal plates (gypsum) of much greater thickness than that which simply refracting plates must have in order to show the ordinary colours of thin plates.—On the changes in arterial blood pressure after closure of all the arteries of the brain, by M. Mayer. There is at first great increase of arterial blood pressure, which is not due either to the mechanical closure, nor to increased activity of the heart, but to intensive stimulation of the cerebral vasomotor centre, through deficient access of arterial blood. In five or ten minutes this excited state of the brain centre passes into that of complete paralysis, indicated by low blood pressure. The author draws some inferences for the doctrine of the vasomotor centres in the brain and spinal cord.

GENEVA

Physical and Natural History Society, March 16.—Prof. Plantamour, fifteen years ago, gave a *résumé* of the results of the meteorological observations made at Geneva since 1826. Disposing, to-day, of fifty years' observations, he examined the modifications made on his conclusions by that new period of fifteen years, and other results which may be deduced. The mean of temperature has been in general greater during the last fifteen years, and enables us to increase by $\frac{1}{10}$ of a degree the annual mean previously deduced. All the monthly means must be slightly augmented, if they are to be derived from fifty years of observation instead of thirty-five; except in the case of the month of December. The following is the table of means (in centigrade degrees) according to the two series:—

	Jan.	Feb.	Mar.	April	May	June	July	Aug.
1826–1860 ...	− 0°34	+ 1°32	4°48	8°61	12°88	16°78	18°53	17°80
1826–1875 ...	− 0·08	+ 1·60	4·60	8·97	13·20	16·81	18·81	17·91
Difference ...	+ 0·26	+ 0·28	+ 0·12	+ 0·36	+ 0·32	+ 0·03	+ 0·28	+ 0·11

	Sept.	Oct.	Nov.	Dec.
1826–1860 ...	14°29	9°81	4°45	+ 0°86
1826–1875 ...	14·66	9·88	4·55	+ 0·80
Difference ...	+ 0·37	+ 0·07	+ 0·10	+ 0·06

The same result appears if we divide the year into seventy-three periods of five days, or pentades, according to the

system of Dove. The comparison of the temperatures of the seventy-three pentades, observed and calculated by the formula, may serve for studying the question raised by M. Ch. St. Claire-Deville, viz., whether there exist certain days or certain epochs of the year when the temperature is lower or higher than is consistent with the regular progress, ascending or descending, of the said temperature. The greater the number of years on which this comparison is based, the more the difference between observation and calculation diminishes, not only absolutely, but in comparison with the mean error. This is contrary to the theory of M. St. Claire Deville, for if there existed a cause of errors at certain determined epochs, they ought to become more pronounced the greater the number of years. By calculating for each pentade the probable error, we may deduce from it the periodical formula representing the variability of the temperature at the various epochs, a variability which differs much in the various months. Thus it is about ± 2°·53 at the beginning of January, it diminishes to ± 1°·77 towards the end of March, rising to ± 1°·84 at the beginning of May; it falls again to ± 1°·38 at the beginning of October, and increases rapidly afterwards to the end of the year. The first days of May, dreaded for a return of cold, correspond closely to a period of very great variability; but these returns of cold do not take place at a fixed period; they may occur from the end of April to the end of June. In relation to the succession of warm years and cold years, there will be recognised incontestably in the fifty years of observations at Geneva, series in which the one or the other predominate in a striking manner. Thus between 1829 and 1834 we find seven warm and two cold years; between 1835 and 1860, twenty-two cold, and four warm years; during the fifteen last years, thirteen warm and two cold. But there is no trace of periodicity in this return of warm or cold years. By establishing four categories for the years, M. Plantamour has found that there has been during the period of half a century, fourteen very cold years, twelve cold, ten warm, and fourteen very warm. The denominations "very cold" and "very warm" are applied to negative and positive divergences surpassing the limit of probable divergence. These figures are very near to the probable figure 12·5 for each category. In the case of a periodic return of warm and cold series, every eleven years taken, for instance, as in the case of the solar spots, as some meteorologists have presumed, the succession of warm and very warm, cold and very cold years, ought to be the most common; on the other hand the succession of years very different in temperature ought to be very rare. But nothing of this kind has been observed; on the contrary, a very cold year may follow a very cold year, or *vice versâ*. It is then impossible to deduce any periodicity in the succession of cold and hot years.

PARIS

Academy of Sciences, Aug. 14.—Vice-Admiral Paris in the chair.—The following papers were read:—Experimental critique on glycæmia (continued). Glycæmia has its source in the glycogenesic function of the liver; by M. Cl. Bernard. 1. The blood of the sub-hepatic veins is more saccharine than the arterial blood and the blood of the *vena porta*. 2. The blood of the inferior *vena cava* is suddenly enriched in sugar (before entering the heart), at the part where the sub-hepatic veins join it.—On the thermal formation of two isomeric propylic aldehydes, by M. Berthelot. The transformation of a primary and normal aldehyde into a secondary isomeric aldehyde liberates very little or no heat. Isomeric bodies of the same chemical function are formed with almost the same liberations of heat, and this similarity subsists in the formation of their isomeric derivatives.—Thermal researches on hydrosulphurous acid, by M. Berthelot. Systems are so much the more stable, other things equal, as they have lost a greater proportion of their energy.—On the dynamical theory of regulators, by M. Rolland.—On a hydrated aluminous silicate deposited by the hot spring of Saint-Honoré (Niévre) since the Roman epoch, by M. Daubrée. This deposit is characterised by the great predominance of silica over alumina and the small quantity of water.—On trepanation of the bones in various forms of osteo-myelitis, by M. Ollier.—Results obtained in treatment of phylloxerised vines with sulpho-carbonates, by M. Marés. He applies to the attacked parts sulpho-carbonate of potassium (1 decilitre per stock) dissolved in water or absorbed in powdered soda-residuum, then hardens the ground by rolling or beating. This proves successful. It should be done before the stock has become stunted; otherwise two or three seasons' treatment may be necessary to recover it, or it may not recover.—Observations on the development and the migrations of Phylloxera, by M. Boiteau.—Employment of a distributing pale to convey sulpho-carbonates to the roots of phylloxerised vines, by M. Gueyraud. The sulpho-carbonates diluted with three or four times their volume of water and distributed at a depth of 25 cm. to 50 cm. destroyed in three days the Phylloxera on the roots, and restored vigour and verdure to the vines.—Treatment of phylloxerised vines at Aimargues (Gard). Employment of a subterranean projector for distribution of the insecticide liquid, by M. Roussellier. With this projector he applies sulphide of carbon, in very small doses, repeated all the summer, to the roots.—On the destruction of Phylloxera by means of decortication of the vine-stocks, by M. Sabaté. In thirty hectares of vines decorticated last winter, not only the old centres of infection had not extended, nor had new ones been formed, but many vines, thought to be gone, had recovered their vigour. In forty non-decorticated hectares, the reverse was the case. The process is accomplished easily with steel gloves.—Discovery of a planet (165), by Mr. Joseph Henry, at Washington, Aug. 10, by M. Leverrier.—Observations of the Perseides, at the Observatory of Clermont-Ferrand, on Aug. 10 and 11, by M. Gruey.—*Résumé* of practical rules of the new navigation, by M. Fasci.—Influence of sonorous vibrations on the radiometer, by M. Jeannel (see note).—Action of hydracids on tellurous acid, by M. Ditte.—On rhodeine from the analytic point of view, by M. Jacquemin. A drop of pure aniline, then of hypochlorite of soda, added to a certain volume of alcohol diluted with water, gives a yellowish colour, passing into green or persistent bluish green. This reaction should prove useful in testing for phenol.—Researches on the derivatives of acetylvalerianic ether, by M. Demarçay.—Examination of the minerals of Chili, by M. Domeyko.—Alterations of the urine in athrepsia of the newly-born; applications to diagnostic, prognostic, and pathogeny, by MM. Parrot and Robin.—Investigation of animal organic matter in ancient strata, by M. Husson. From his comparisons he concludes:—1. That bitumens with tarry odour are of essentially vegetable origin. 2. That those with fetid odour, recalling Dippel oil, are of animal origin. 3. That these are, in secondary and tertiary strata, the last remains of the animal substance which is found already profoundly altered in the diluvium, and which exists in great part in the state of osseine in the ground of our bone-caverns.—Experiments on mechanical reproduction of the flight of a bird, by M. Tatin. He obtained much better effects with his mechanical birds (worked by caoutchouc springs) by always placing the centre of gravity before the centre of suspension.—Stratified beds of massive silex observed near Digrin (Saône-et-Loire) in a formation considered as cretaceous, by M. Canat.

CONTENTS

Erratum.—Vol. xiv. p. 338, col. 1, line 9 from bottom, for "Umbelliferæ" read "Umbellulariæ."

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